FURUNO

INSTALLATION MANUAL

MARINE RADAR

MODEL FR-2110/FR-2120

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

9-52, Ashihara-cho,
Nishinomiya, Japan 662

Telephone: 0798-65-2111
Telefax: 0798-65-4200

·Your Local Agent/Dealer

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⚠ SAFETY INSTRUCTION

"**NOTIICE**", "**CAUTION**" and "**WARNING**" notices appear throughout this manual. It is the responsibility of the installer of the equipment to read, understand and follow these notices. If you have any questions regarding these safety instructions, please contact a FURUNO agent or dealer.

⚠ WARNING	This notice indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	This notice indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or property damage.
NOTICE	This notice indicates an unsafe practice which, if not avoided, could result in property damage or equipment malfunction.

⚠ WARNING

Hazardous voltage. Can shock, burn, or cause death.

Only qualified personnel should work in the unit.

Turn off the power at the ship's mains switchboard before beginning the installation. Post a warning sign near the switchboard to ensure the power will not be applied while the radar system is being installed.

Electrical shock, fire, serious injury or death can result if the power is not turned off, or is applied while the equipment is being installed.

⚠ CAUTION

Ground both the display unit and the antenna unit.

Ungrounded equipment can give off or receive interference or cause electrical shock.

Confirm that the power supply voltage is compatible with the voltage rating of the equipment.

Connection to the wrong power supply can cause fire or equipment damage. The voltage rating appears on the label at the rear of the display unit.

Use only the supplied power cable.

Use of other power cables (particularly cables whose diameter is smaller than the supplied cable) can cause fire or short circuit.

Use the correct fuse.

Use of a wrong fuse can cause fire or equipment damage.

NOTICE

The installation must be done by a FURUNO representative or suitably qualified radar technician.

Authorities require this.

The mounting location must satisfy the following conditions:

- Useable temperature: -15°C to 55°C
- Out of direct sunlight
- Away from air conditioner vents
- Well ventilated

Observe the compass safe distances to prevent deviation of a magnetic compass.

	Standard compass		Steering compass	
Display Unit	1.2 m		0.9 m	
Scanner Unit	FR-2110	FR-2120	FR-2110	FR-2120
	1.5 m	4.1 m	0.8 m	2.5 m

Keep magnets and magnetic fields away from the equipment.

Magnetic fields will distort the picture and can cause equipment malfunction. Be sure the unit is well away from equipment which gives off magnetic fields (speaker, power transformer, etc.).

Table of Contents

IMPORTANT

Settings According to Class and Flag of Vessel

Overview

A DIP switch and a menu setting enable the setting up of this radar according to class and flag of vessel. Be sure to set them accordingly.

Merchant vessel or fishing vessel

The menus differ between merchant and fishing vessels. The menu type is set by DIP switch S1 #2 on the SPU Board SPU-9111.

DIP Switch	Merchant Vessel	Fishing Vessel
S1 #2	OFF	ON

Vessel's flag

The specifications for radars differ among nations. The specifications are set on the INITIAL SETTING 2 menu.

INITIAL SETTING 2 menu	Types to be selected
3 TYPE	R : Regular N : Netherland G : German

UNIT INSTALLATION

Scanner Unit Installation

Overview

The scanner unit consists of the scanner radiator and the scanner unit chassis. They are packed separately to prevent damage during shipment. Assemble them, and then mount them on the scanner unit mast.

Before beginning the installation...

Please read the following installation precautions.

- Installation of the scanner unit is dangerous. Always use proper safety equipment such as safety helmet and safety belt when working on the scanner unit mast.
- To hoist the scanner unit to the mounting location, attach a rope or chain to the lifting fixtures on the chassis. **DO NOT LIFT THE SCANNER UNIT BY THE RADIATOR.**
- If exposed hardware is to be painted, after installation, be sure no paint contacts the radiator.
- Secure sufficient mounting space for the scanner unit to prevent injury to the installing technician by falling.

Siting considerations

The scanner unit is generally installed above the keel line on top of the wheelhouse or on an appropriate platform on the scanner unit mast. When selecting a mounting location, consider the following points.

- No funnel, mast or derrick should be within the vertical beamwidth of the scanner (XN2/3, 25°; XN3A/4A, 20°) in the bow direction, especially zero degrees ±five degrees, to prevent blind sectors and false echoes on the radar picture.
- Fumes from the funnel or other exhaust vent can adversely affect performance and hot gas can distort the radiator portion. The scanner unit must not be mounted in a place where the temperature may exceed 70°C.
- Locate the unit well away from the aerial of a radiotelephone or navigation receiver; separation of more than 2 meters is recommended.
- Leave sufficient space around the unit for maintenance and servicing. See the scanner unit outline drawing for recommended space.

Compass safe distances

A magnetic compass will be affected if placed to close to the scanner unit. Table 1-1 gives the minimum recommended safe separation distances.

Table 1-1 Scanner unit compass safe distances

Compass	FR-2110	FR-2120
Standard	1.5 m	4.1 m
Steering	0.8 m	2.5 m

Assembling

The numbers in parentheses refer to the parts numbers in the scanner unit assembling drawing.

Radiator type XN2 (123 cm), XN3 (200 cm)

Refer to the scanner unit assembling drawing on page D-9.

1) Insert the O-ring (1) into the O-ring groove of the radiator flange of the rotary joint. Fix the feeder waveguide with hex. bolts (2), and washers ((3), XN2 and (4), XN2).
2) Loosely fasten the antenna radiator to the radiator bracket with hex. bolts (5) and (8), spring washers ((6), XN2), flat washers (7) and (9), spring washers (10), and hex. nuts (11).
3) Insert the O-ring (1) into the O-ring groove of the flange section of the feeder waveguide. Fix the feeder waveguide with hex. bolts (2), and washers ((3), XN2 and (4), XN2).
4) **FOR THE XN3**, fix the feeder waveguide at the bottom of the antenna radiator with the W/G (waveguide) clamp (13), W/G gasket (14), and hex. bolts (12).
5) Securely fasten the antenna radiator to the radiator bracket.

Radiator type XN3A (200 cm), XN4A (240 cm)

Refer to the scanner unit assembling drawing on page D-10.

1) Insert the O-ring (1) into the O-ring groove of the radiator flange of the rotary joint. Fix the feeder waveguide with hex. bolts (2).

2) Loosely fasten the antenna radiator to the radiator bracket with hex. bolts (3) and (6), flat washers (5) and (7), spring washers (4) and (8), and hex. nuts (9).

3) Insert the O-ring (1) into the O-ring groove of the flange section of the feeder waveguide. Fix the feeder waveguide with hex. bolts (2).

4) Fix the feeder waveguide at the bottom of the antenna radiator with the W/G clamp (13), W/G gasket (14), hex. bolts (10), flat washers (12), and spring washers (11).

5) Securely fasten the antenna radiator to the radiator bracket.

HOW TO APPLY SILICONE SEALANT TO FLANGE SECTION OF FEEDER WAVEGUIDE

- Be sure silicone sealant does not enter O-ring choke groove.
- Before applying silicone sealant be sure the surface of the waveguide flange is clean. Evenly coat the waveguide flange with the sealant as illustrated below. Apply just enough sealant so it just oozes out when the bolts are tightened. Over application may leak the sealant into the choke groove and waveguide.

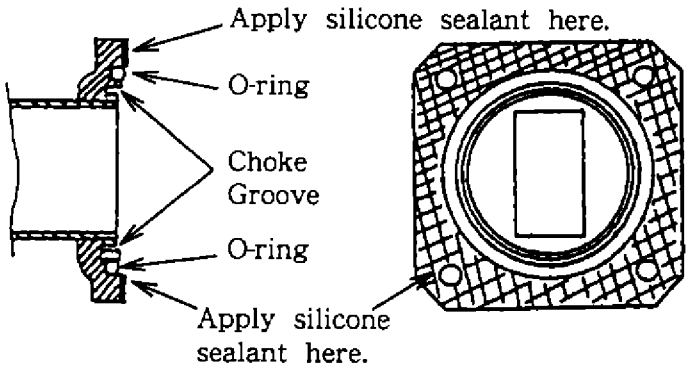


Figure 1-1 How to apply silicone sealant to the waveguide flange

Mounting

Refer to the scanner unit outline drawings on page D-5, D-6 (FR-2110) or D-7, D-8 (FR-2120).

1) Drill four bolt holes (15 mm diameter) and one cable entry hole (50 mm diameter approximately) in the radar mast platform or the deck.

2) Lay the rubber mat (supplied) on the mounting location.

3) Place the scanner unit on the rubber mat and orient it so the bow mark (Δ) on its base is facing the ship's bow.

   ■ **NOTE:** *To hoist the scanner unit to the mounting location, attach a rope or chain to the lifting fixtures on the chassis.* **DO NOT LIFT THE SCANNER UNIT BY THE RADIATOR.**

4) Fasten the scanner unit with M12 × 60 bolts, nuts, flat washers and seal washers. Refer to figure on the next page.

5) Establish the ground. Use M6 × 25 bolt, nut, flat washer and ground wire. The location of the ground should be within 300 mm from the ground terminal on the scanner unit.

   Then, connect the ground wire to the ground terminal on the scanner unit. Refer to the figure on the next page.

6) Coat the ground point and the ground terminal with silicone sealant (supplied) to prevent electrolytic corrosion.

Guidelines for installation

- The scanner unit is made of cast aluminum. To prevent electrolytic corrosion, mount the unit with the rubber mat and seal washers (both parts supplied).
- Ground the scanner unit as illustrated below.

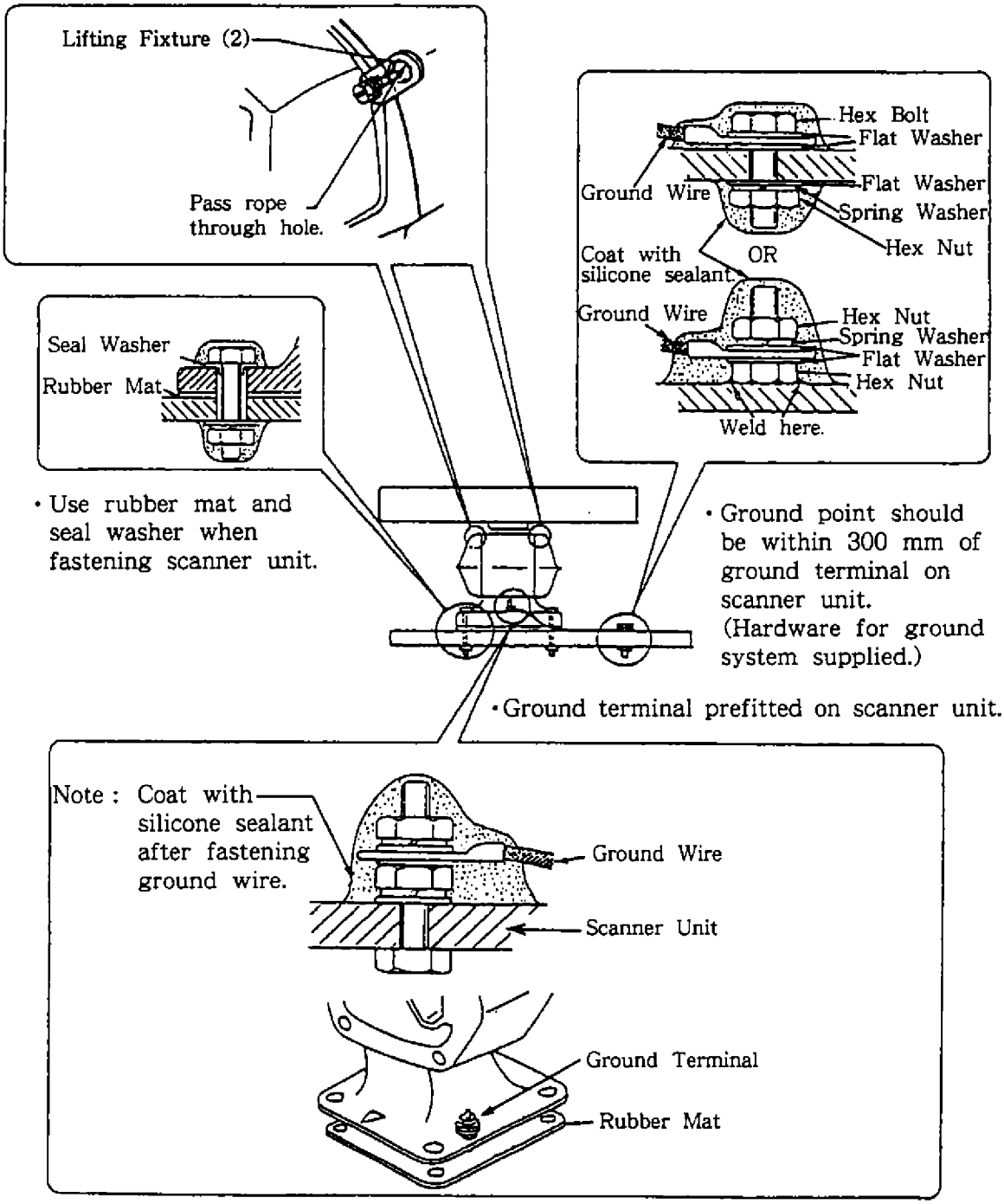


Figure 1-2 Guidelines for installing the scanner unit

Display Unit and Control Unit Installation

Installation method

The display unit can be mounted on a tabletop or in a console. The control unit can be separated up to 10 meters from the display unit (10 meter interconnection cable required, option).

Compass safe distance

A magnetic compass will be affected if placed to close to the display unit. Table 1-2 gives the minimum recommended safe separation distances.

Table 1-2 Display unit compass safe distances

Compass	FR-2110	FR-2120
Standard	1.2 m	
Steering	0.9 m	

Siting considerations

Locate the display unit in a place where it can be viewed and operated conveniently. Other points to consider when selecting a mounting location are as follows.

- The location should be free of water spray.
- The daylight bright type radar display provides excellent visibility even in direct sunlight. However, locate the unit out of direct sunlight and away from heat sources because of heat that can build up inside the cabinet.
- The signal cable between the scanner unit and the display unit comes supplied in lengths of 15, 20 or 30 meters (100 meters maximum length). Keep this in mind when selecting the location.
- Leave sufficient space around the unit for maintenance and servicing. See the display unit outline drawing for recommended space.
- The orientation of the display unit should be so the operator views the screen while facing the bow. This makes determination of position much easier.

Mounting

Tabletop

1) Unfasten the two M10 bolts at the front of the display unit to dismount the mounting base from the display unit.
2) For fixing the unit by nuts, bolts and washers, mark mounting holes of 12 mm diameter in the tabletop. (Refer to the display unit outline drawing for mounting dimensions.)
3) Secure the mounting base to the tabletop by using 9 mm diameter coach screws, or M10 nuts, bolts and flat washers.
4) Place the display unit on the top of the mounting base and fasten it with the two bolts removed at step 1.

Console

1) Referring to the display unit outline drawing, mark six mounting holes of 15 mm diameter and one cable entry hole.
2) Open the lid at the bottom front of the unit. Fix the unit to the deck with M12 nuts, bolts and washers, or 12 mm diameter coach screws.

Scanner Unit Wiring

Handling the transceiver unit

The transceiver unit contains the magnetron. The magnetron will demagnetize if it contacts magnetic material. When dismounting the transceiver, lay it atop non-magnetic material or lay it on its side, to prevent demagnetization. See Figure 2-1.

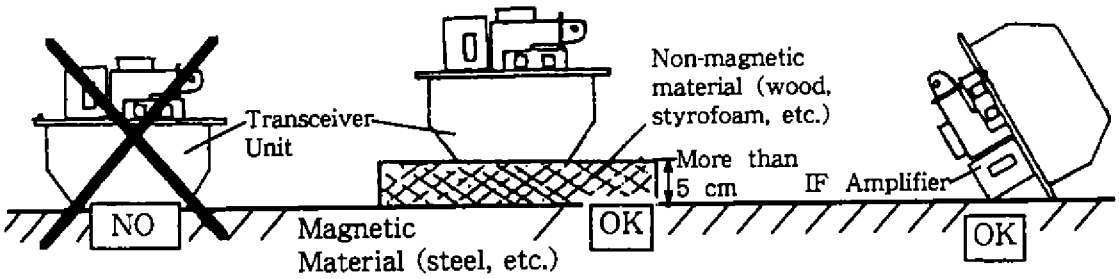


Figure 2-1 How to prevent magnetron demagnetization

Wiring

1) Open the scanner unit cover.
2) Disconnect plugs P801 and P601. Unfasten the transceiver unit fixing bolts (two on FR-2110; four on FR-2120) to dismount the transceiver unit from the scanner unit.

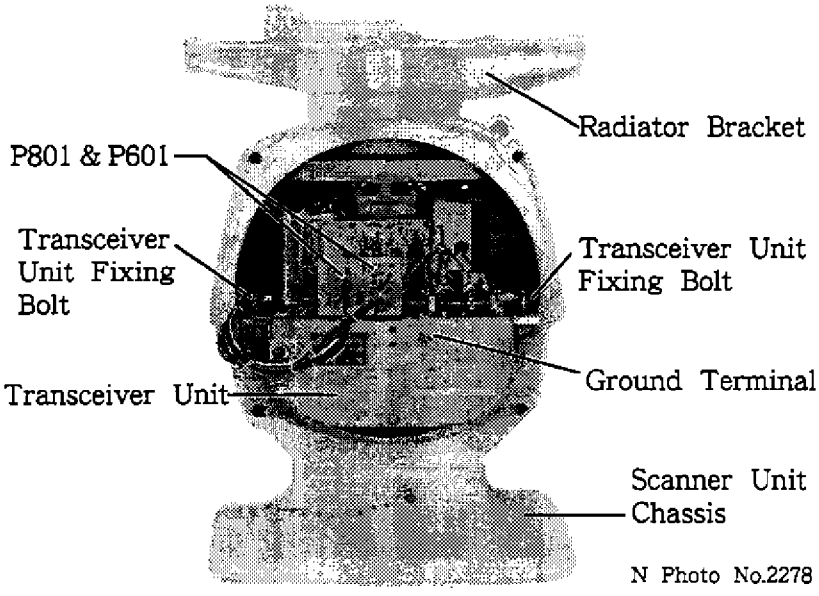


Figure 2-2 Transceiver unit

3) Unfasten the four fixing bolts on the cable gland at the base of the scanner unit. Remove clamping ring, rubber gasket and flat washers. See Figure 2-3.

4) Pass the signal cable through the cable entry hole in the scanner unit mounting platform. Trim the cable so about 80 cm of it protrudes past the cable gland.

   Then, slide the flat washer, rubber gasket, flat washer and clamping ring onto the cable in that order.

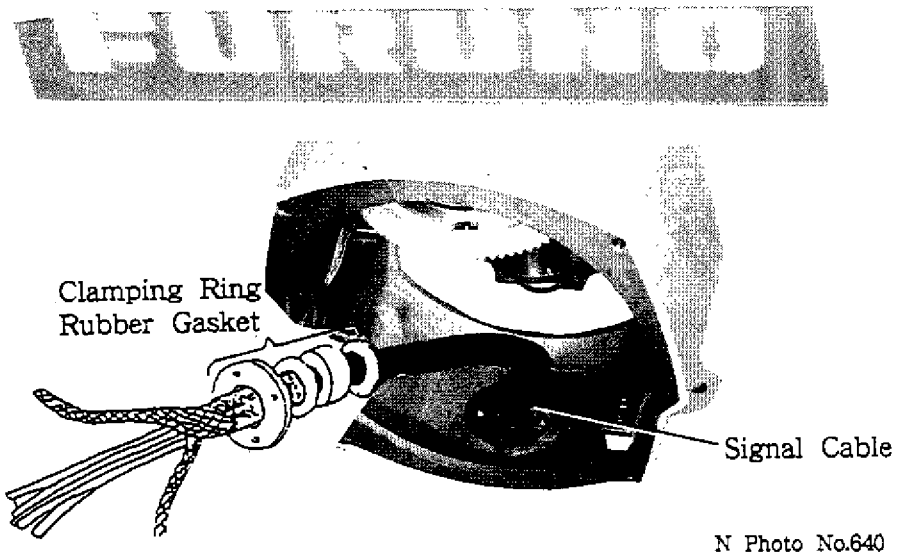


Figure 2-3 Passing cable gland assembly materials onto signal cable

5) Fabricate the signal cable by referring to page 2-5 (RW-4873) or 2-6 (RW-6895). Then, check cable conductivity.

6) Referring to Figure 2-7 (RW-4873) or Figure 2-10 (RW-6895), pass the outer and inner shields between the signal cable and the clamping ring. Fasten the cable gland.

7) Connect the signal cable to the terminal board RTB801 by referring to the interconnection diagram. Leave "slack" in the coaxial wire to prevent breakage. See Figure 2-6 or Figure 2-9.

8) Referring to Figure 2-11, bind cores with cable ties.

9) Install the transceiver unit. Connect plugs P801 and P601. Fasten the shields (inner and outer combined) to the ground terminal on the transceiver unit. See Figure 2-2.

10) Confirm that all screws are tightened and all wiring is properly made. Coat waterproofing gasket, bolts and tapping holes of scanner unit with silicone grease. Close the scanner unit cover. See Figure 2-12 to confirm that the waterproofing gasket is properly seated.

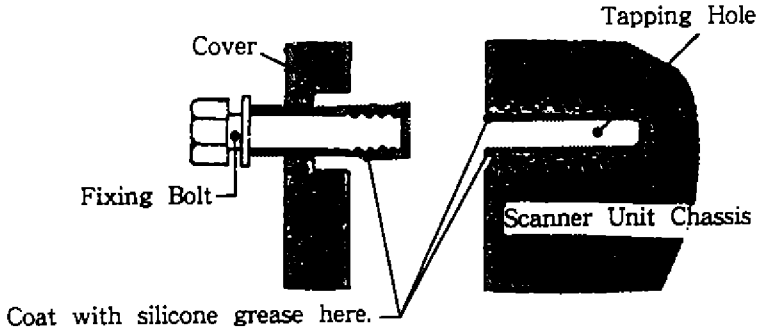


Figure 2-4 Coating scanner unit cover with silicone grease

Fabricating signal cable RW-4873

1) Remove the vinyl sheath by 450 mm.

2) Slide the flat washer, rubber gasket, washer, and clamping ring onto the signal cable.

3) Unravel the outer shield to expose the cores in the outer layer. Then, unravel the inner shield to expose the cores in the inner layer. Label all inner cores to aid in later identification.

4) Trim each core (except coaxial wire) considering the distance to their terminals on the terminal board.

5) Trim the inner and outer shields leaving 50 cm each. Combine shields and attach crimp-on lug FV5.5-4 (blue, ø4).

6) Remove core insulation by 6 mm approximately. Fix crimp-on lug FV1.25-M3 (red, ø3) to each core.

7) Fabricate the coaxial wire as shown in Figure 2-6. Make the length 10 mm longer than the shield to prevent wire strain. Attach crimp-on lug FVD1.25-3 (red, ø3).

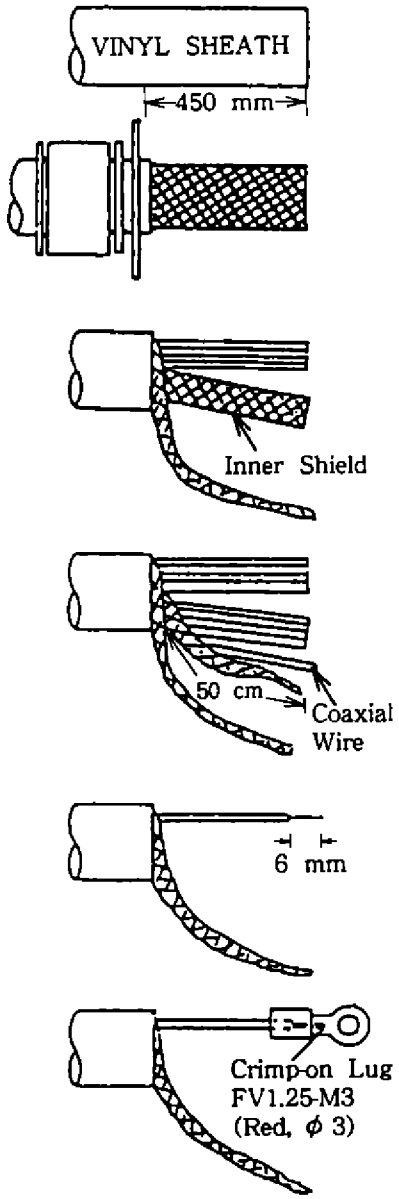


Figure 2-5 Fabricating signal cable RW-4873

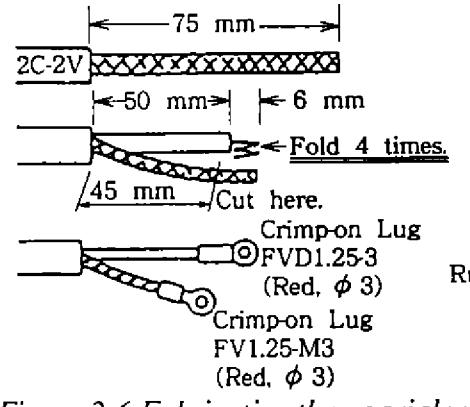


Figure 2-6 Fabricating the coaxial wire

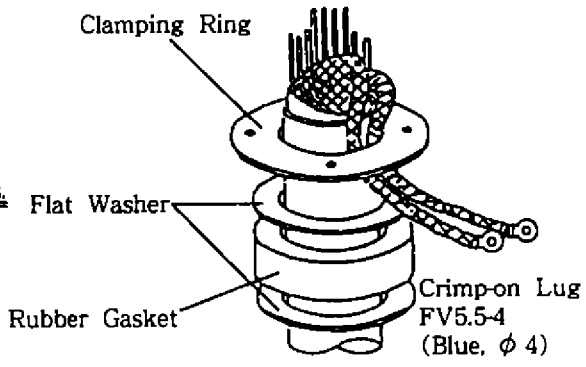


Figure 2-7

Fabricating signal cable RW-6895

1) Remove the anti-corrosive sheath by 500 mm. Remove the armor and vinyl sheath leaving 50 mm each approximately.

2) Fold back the armor and trim to suitable length. Then, slide the flat washer, rubber gasket, washer and clamping ring onto the cable.

3) Unravel the outer shield to expose the cores in the outer layer. Then, unravel the inner shield to expose the cores in the inner layer. Label all inner cores for later identification.

4) Trim each core (except coaxial core) considering their locations on the terminal board.

5) Trim the inner and outer shields leaving 50 cm each. Combine shields and attach crimp-on lug FV5.5-4 (blue, ø4).

6) Remove core insulation by 6 mm approximately. Attach crimp-on lug FV1.25-M3 (red, ø3) to each core.

7) Fabricate the coaxial wire as shown in Figure 2-9. Make the length 10 mm longer than the shield to prevent wire strain. Attach crimp-on lug FVD1.25-3 (red, ø3).

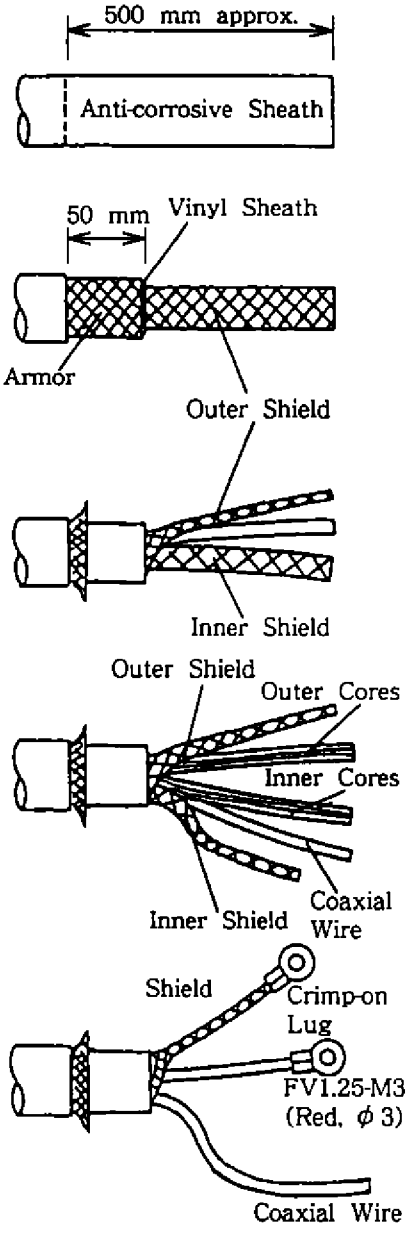


Figure 2-8 Fabricating signal cable RW-6895

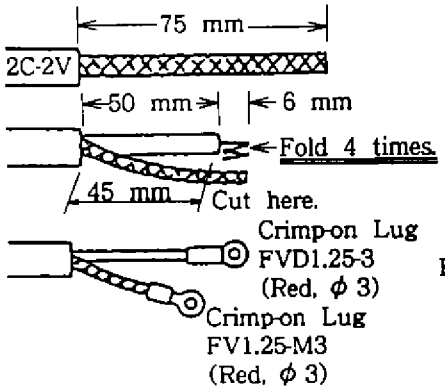


Figure 2-9 Fabricating the coaxial wire

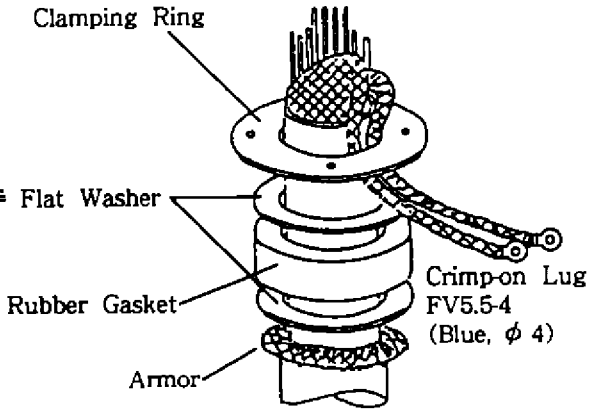


Figure 2-10

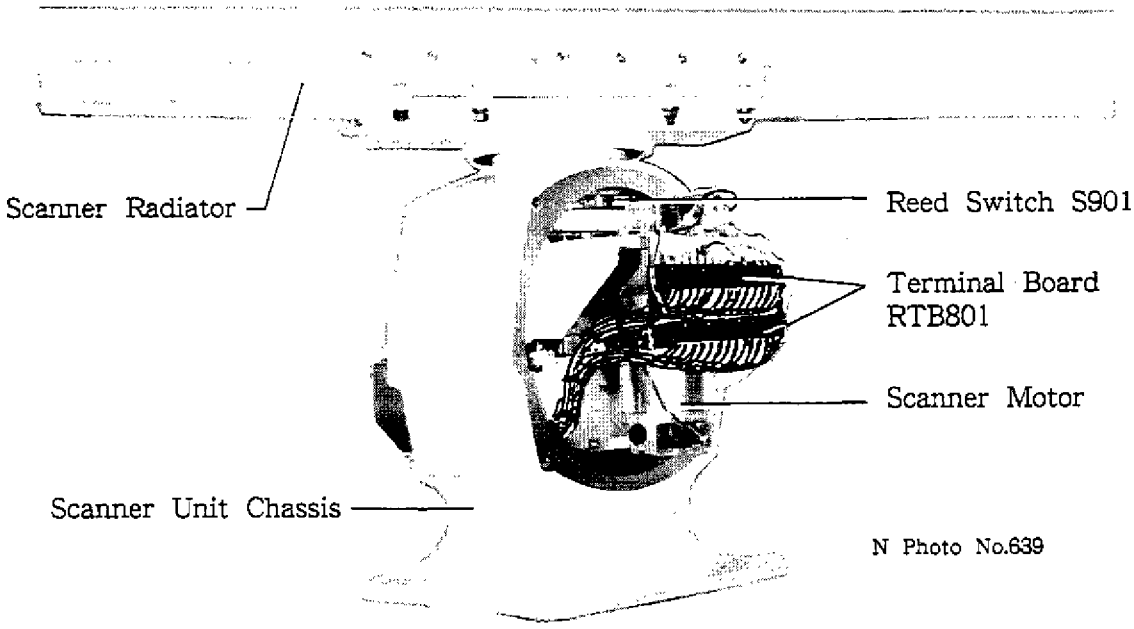


Figure 2-11 Scanner unit, cover opened

Closing the scanner unit cover

Before closing the scanner unit cover, confirm that the waterproofing gasket is properly seated in its groove and is free of foreign material. Improperly seated or soiled gasket will allow water to leak inside the unit, permanently damaging the circuits inside.

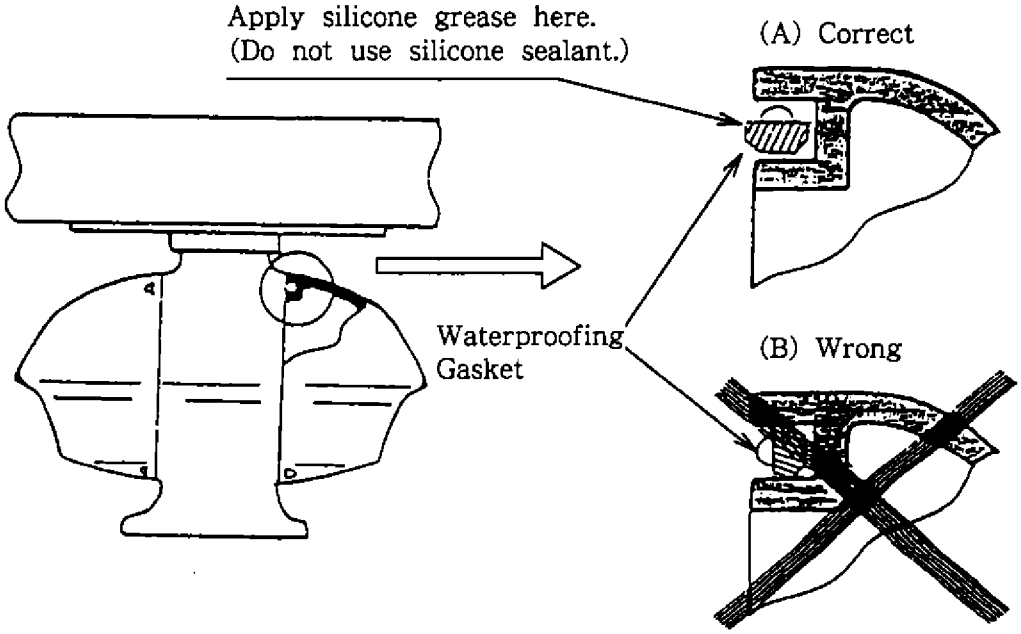


Figure 2-12 Seating of waterproofing gasket

Display Unit Wiring

Overview

Two cables are terminated at the display unit: the signal cable RW-4873 (no armor) or RW-6895 (with armor) and the power cable. The signal cable, available in lengths of 15 m, 20 m or 30 m, comes prefitted with a connector for connection to the display unit. Proper grounding of cables cannot be stressed enough; ground the armor of all cables by their cable clamp.

Fabricating the power cable (tabletop-type)

Power cable CVV-S 8 × 2C

1) Remove the vinyl sheath by 60 mm.
2) Unwind the cloth tape and cut it off.
3) Unravel the braided shield to expose the cores by about 40 mm.
4) Remove core insulation by about 10 mm. Fix crimp-on lugs to the cores and braided shield.
5) Cover the braided shield with vinyl tape, leaving the portion which will lie inside the cable clamp untaped.

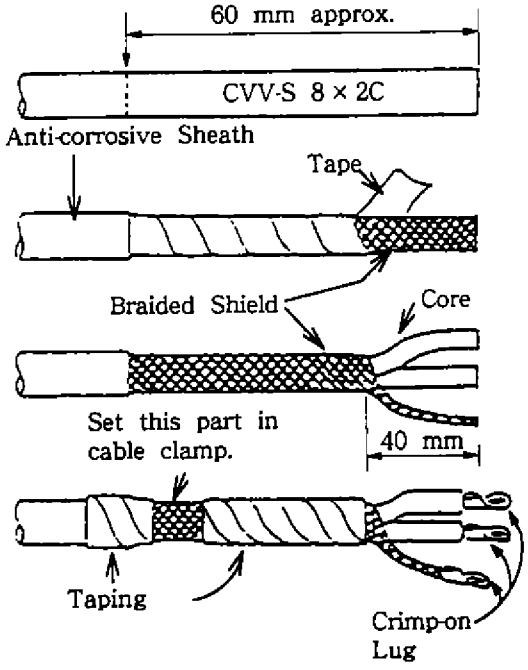


Figure 2-13 Fabricating power cable CVV-S 8 x 2C

Fabricating display unit end of signal cable (tabletop-type)

Unwrap taping as shown below to expose the portion of the braided shield which will lie inside the cable clamp.

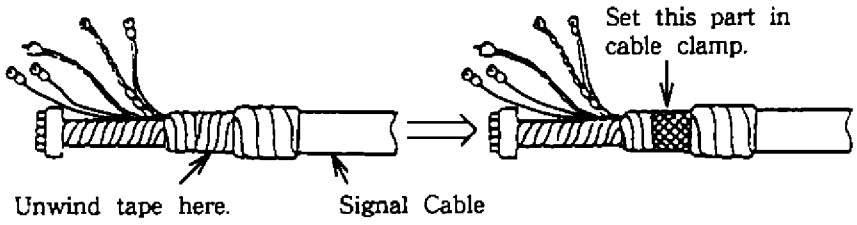


Figure 2-14 Signal cable

Connections

Connect cables as shown in Figure 2-15. Refer to the interconnection diagram.

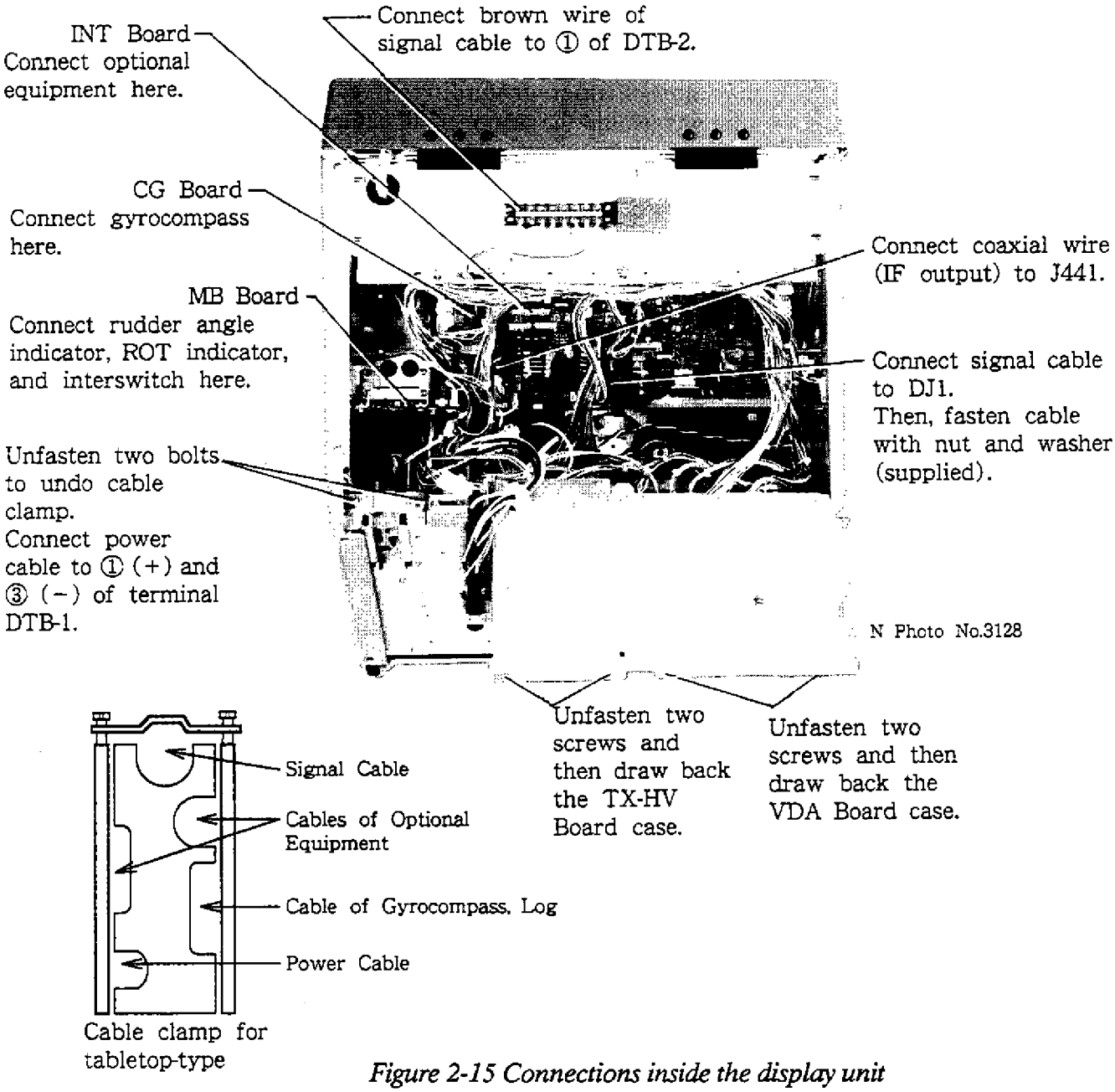
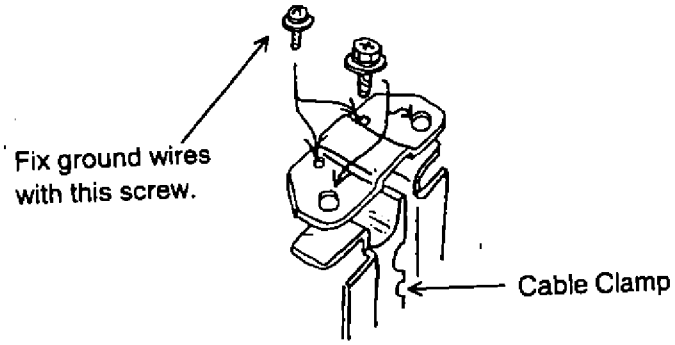


Figure 2-15 Connections inside the display unit

Notes

- The cable clamp of the console-type display unit is on the underside of the console.
- When the control unit is separated from the display unit, connect cable between control unit and J403 on the MB Board.
- When finished, cover unused cable entry gland with aluminum tape.
- Fasten the shield of the signal cable and the power cable together by a fixing screw on the terminal board DTB-1.

- Ground wires of all cables should be connected to the cable clamp as shown below.



Cable fabrication for console-type

Since the cable clamp is on the underside of the console, the clamping points of the power cable, signal cable and the cables of optional equipment are different from those of the tabletop-type.

Power cable

1) Strip off about 3 cm of the vinyl sheath 130 cm from the end of the cable to expose braided shield.
2) Fabricate the end of the cable as shown in Figure 2-13.

Signal cable and cables for slave display and navigational equipment

1) Strip off about 3 cm of the vinyl sheath 150 cm from the end of the cable to expose braided shield.
2) Tape the shield leaving about 2 cm of it exposed.

Optional gyro, speed log and ROT rudder cables

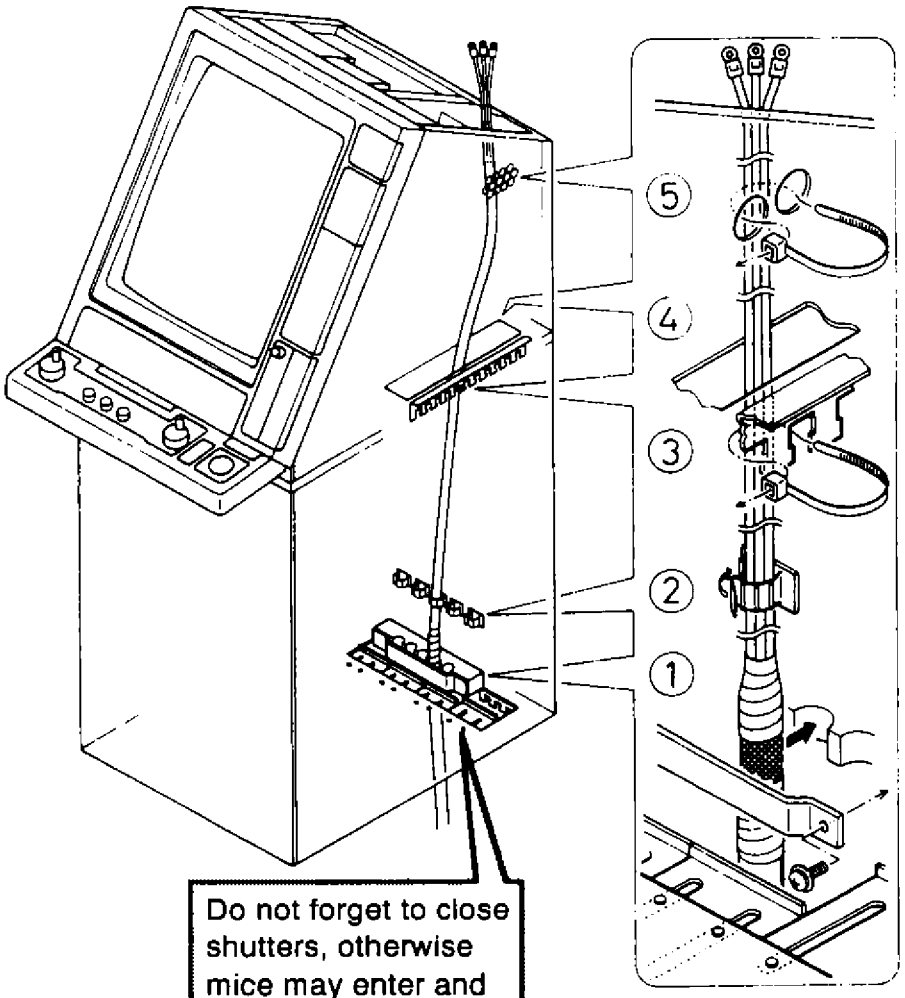
1) Completely remove the sheath by 150 cm from the end of each cable in order to pass the cables.

After wiring, bind the cables by cable ties.

Correction to Interconnection Diagram (Page S-1): Please read "FG" except DTB-2, #8 in the diagram as "GND".

How to route the cables

The figure below shows how to clamp and fix the cables inside the console type display unit.



* Ground the cables through the cable clamp.

Connection of RSD (Output data)

Radar System Data (RSD) in NMEA0183 format is output from J455 (INS) on the INT board. The ground (GND) wire of the interconnection cable is connected to #1, #3 or #5 of J442/443.

INITIALIZATION AND ADJUSTMENT

IMPORTANT!

Before proceeding the initialization and adjustment, radar model should be selected on the INITIAL SETTING menu.

Follow the steps below.

1. **Set the DIP Switch S1, #4 to "ON".**
2. **Press [RADAR MENU] [0] [0] [2] [0] [0] [0] and the INITIAL SETTING 4 menu will appear.**
3. **Pressing [2] changes the radar model. "OTHER X-BND" includes FR-2120W/2150W/2150, while "OTHER S-BND" includes FR-2130S/2130SW/2160SW.**

The "Adjustment Check List", provided at the end of this chapter will help you not miss any necessary setting and adjustment.

Selection of Vessel Class

Overview

The radar has two sets of menu systems: one for merchant vessels and one for fishing vessels. Select one according to class of vessel.

Request for removal of pages in operator's manual

The operator's manual contains pages marked for use by merchant vessels or fishing vessels. Those are pages 9, 10 and 14. Please remove inapplicable pages.

How to select

The #2 segment of DIP Switch S1 on the SPU Board (SPU-9111) sets class of vessel. Set it accordingly as shown in the table which follows.

S1#2	Specification
ON	Fishing Vessel
OFF	Merchant Vessel

Differences in specifications

The items appearing on the RADAR and NAV menus differ by vessel specification. Table 3-1 tabulates those differences.

Table 3-1 Differences in menus for merchant and fishing vessels

Menu	Fishing Vessel Specification	Merchant Vessel Specification
RADAR menu, FUNCTION KEY menus	The items "RIVER" and "BIRD" appear.	No "RIVER" nor "BIRD".
RADAR menu, SYSTEM SETTING 1 menu	The item "LONG LINE" appears with connection of RP-23 (option).	No "LONG LINE".
NAV menu, NAV INFORMATION 3 menu	Depth unit available in meters, feet or fathoms.	Meters only

Setting Function Keys

Overview

The radar has three function keys which automatically set up the radar according to the conditions ascribed to them. Confer with ship owner and radar operator to determine suitable program for each key. Attach appropriate key label (supplied with the accessories package) to each key to denote their function.

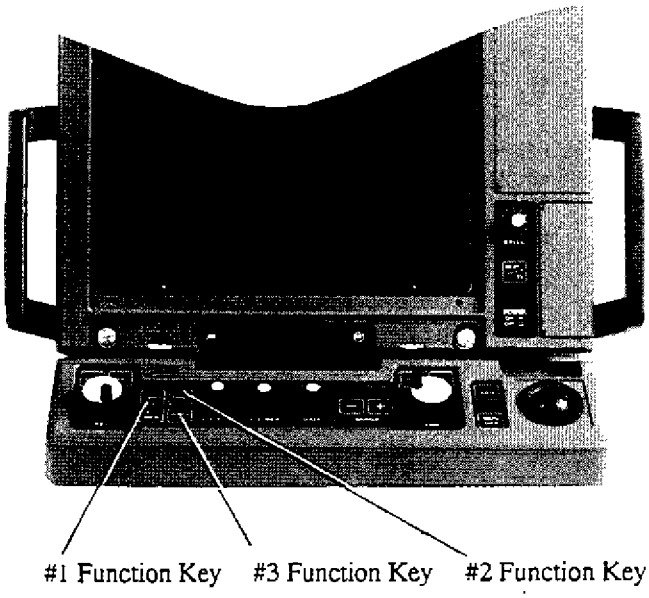


Figure 3-1 Display unit, front view

Procedure

Refer to pages 9 through 11 in the operator's manual.

- Assign task to each function key: picture setup, specific operation or watch alarm (function key #3 only).
- Each picture setup condition is programmed with optimal settings for interference rejection, echo stretch, echo averaging, automatic clutter removal, pulsewidth, and noise rejection. Therefore, adjustment of the default setting is not necessary. Any adjustment may adversely affect the target detection ability of the radar. Please explain this to the user.

Restoring default function key settings

Open INITIAL SETTING 3 menu and select "0. FACTORY DEFAULT".

Adjustment of Video Amplifier Level

Overview

When the signal cable is very long, the video amplifier input level decreases, shrinking target echoes. To prevent this, confirm (and adjust if necessary) video amplifier input level.

Procedure

1) Transmit the radar on the 12 mile range.
2) Measure video amplifier input level on the VIDEO AMP Board (VDA-9114) in the display unit as directed in the table which follows.

Check Point	Rating	Measuring Conditions	Adjustment Pot.
TP3 (take trigger at TP11)	4.2 Vpp (strong signal)	Turn off A/C SEA, A/C RAIN, and INTERFERENCE REJECTION.	VR402 (INT PCB)

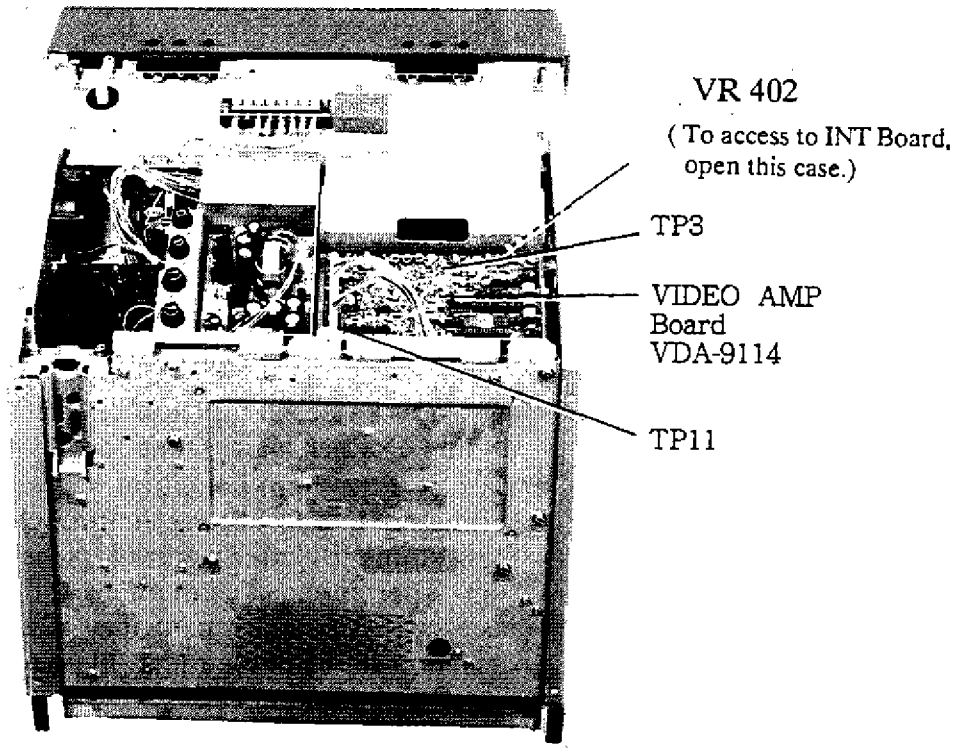


Figure 3-2 Display unit, top view, cover removed

Suppression of Main Bang

Overview

If main bang appears at the screen center, suppress it as follows.

Procedure

1) Transmit the radar on a long range and then wait ten minutes. Then, adjust sensitivity to show a slight amount of noise on the display.
2) Select the 0.25 mile range. Adjust the **A/C SEA** control to suppress sea clutter.
3) Open the top right-hand panel on the display unit. Slowly turn VR301 (MBS-L) clockwise to suppress main bang. Note that excessive main bang erases targets in close range.

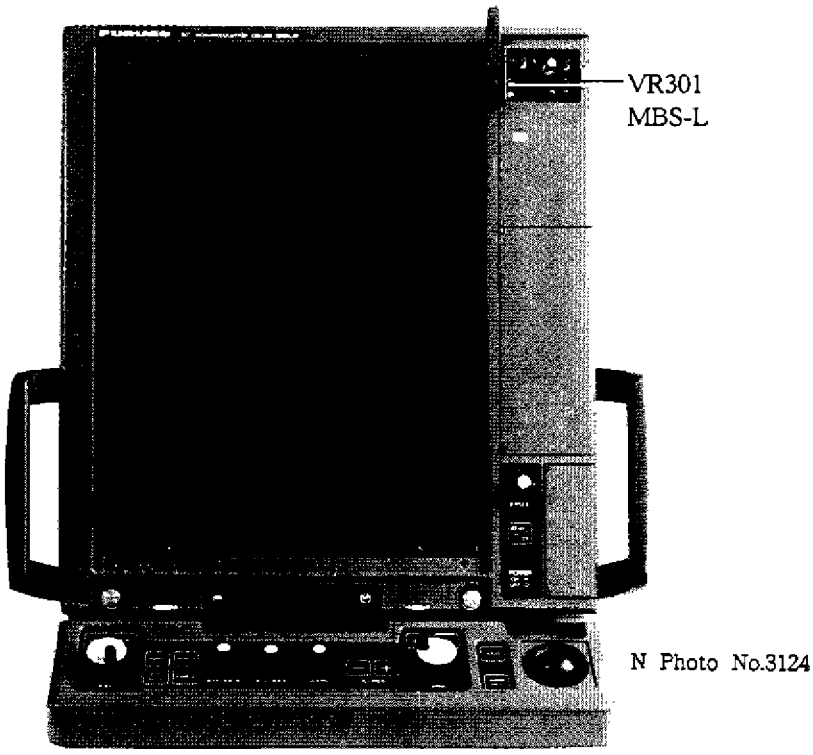


Figure 3-3 Display unit, front view

Confirmation of Tuning Condition

Overview

The radar receiver can be tuned both automatically and manually. Confirm that the receiver is properly tuned in both conditions.

Procedure

Adjust tuning with the TUNE switch and TUNE control inside the top right-hand panel on the display unit.

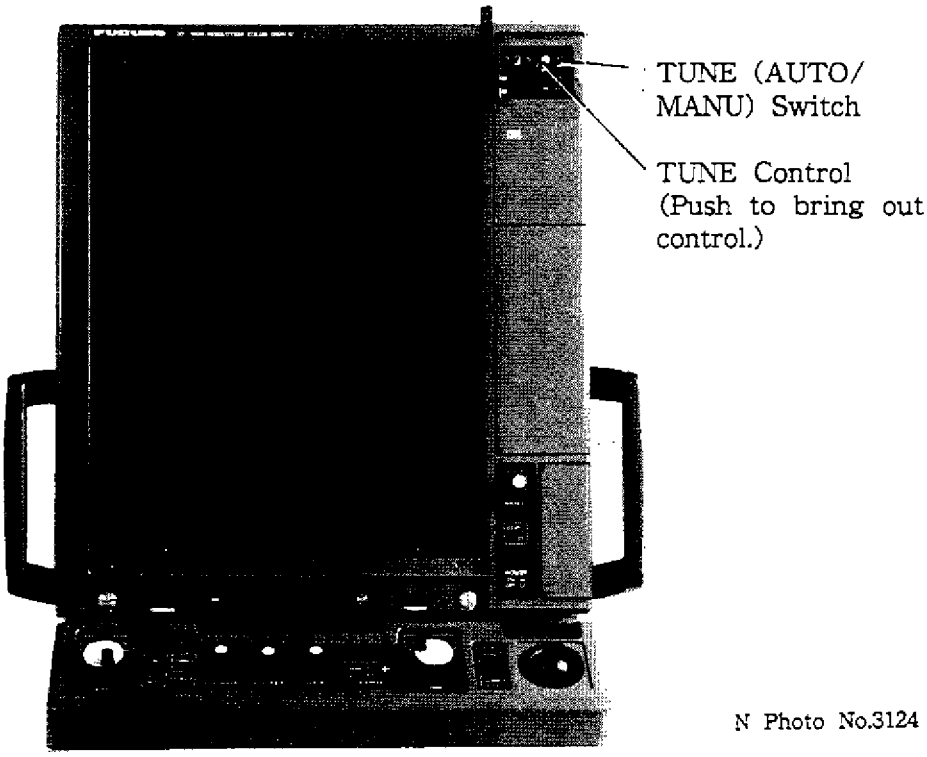


Figure 3-4 Display unit, front view

1) Set the TUNE switch to MANU. Transmit the radar on the 48 mile range. Adjust sensitivity and picture brilliance, and set **A/C SEA** and **A/C RAIN** controls fully counterclockwise (off).

2) While observing the picture, adjust the TUNE control slowly to find best tuning point. (Turning the control quickly two or more turns counterclockwise or clockwise yields lowest or highest tuning voltage, respectively.)

3) Set the TUNE switch to AUTO. Wait until the radar is tuned (about 10 seconds or about four scanner rotations).

4) Confirm that the radar found best tuning point. Peak tuning is obtained when about 80% of the tuning display lights.

Initialization

Overview

Initialization sets up the radar by the following conditions

(1) required settings
(2) user requests (if applicable)
(3) settings required by a service technician, and
(4) factory settings only.

Table 3-2 shows where you set the above-mentioned conditions.

Table 3-2 Initialization items and where to set them

Menu / Condition	INITIAL SETTING					SHIP INFO.
	1	2	3	4	5	
(1)	2 to 6			2		2 to 4
(2)		2 to 4	2 to 4	4, 5	6, 9	
(3)	8 to 9	5 to 9	5			5 to 7
(4)			6, 7			

How to display the menus for initialization

The menus for initialization of the radar (INITIAL SETTING and SHIP INFORMATION) are not accessible by the user, to prevent adjustment of settings. To access the menus, turn on the #4 segment of DIP Switch S1 on the SPU Board in the display unit. Then you can access them by pressing the **RADAR MENU** key. See the next page for initial setting menu tree.

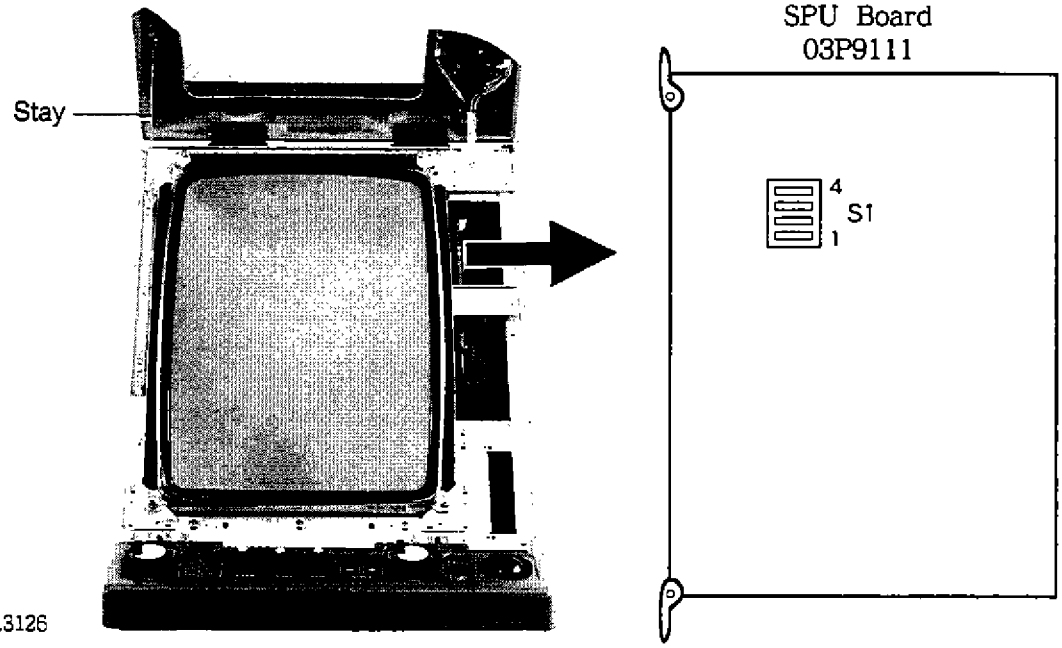
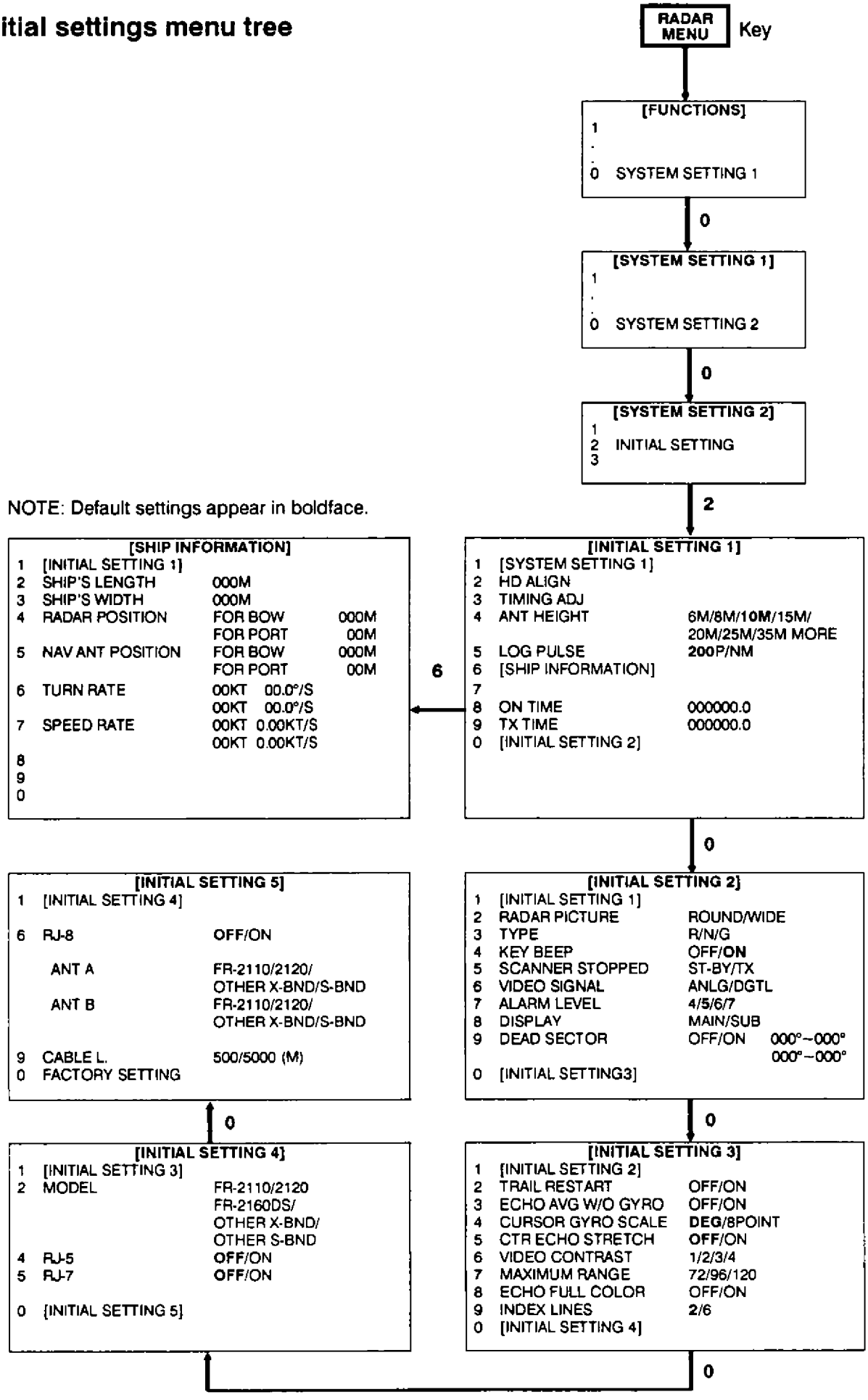


Photo No.3126

Figure 3-5 Display unit, front view, cover opened, showing location of SPU Board

Initial settings menu tree



Setting procedure

1) Press numeral key to select item.
2) Press **same** numeral key pressed in step 1 to select option. Current selection appears in reverse video.
3) Set other items by repeating steps 1 and 2.
4) Press the **ENTER** key to register options.
5) Press the **RADAR MENU** key to close the menu.

Initial settings menus description

Table 3-3 describes the initial settings menus. Menu items in boldface must be set at installation.

Table 3-3 Initial settings menu description

Item	Function
INITIAL SETTING 1 menu	
HD ALIGN	Compensate for scanner unit installation error in ship's bow direction. See page 3-14.
TIMING ADJ	Sweep timing varies with the length of the signal cable between the scanner unit and display unit. See page 3-13.
ANT HEIGHT	Set height from sea surface to scanner radiator.
LOG PULSE	Set speed log's pulse rate.
ON TIME	Display total hours the radar has been turned on and transmitted. Service technician can change display when replacing magnetron, etc.
TX TIME	
SHIP INFORMATION menu	
SHIP'S LENGTH	Set ship's physical data, for use with anchor watch alarm, etc.
SHIP'S WIDTH	
RADAR POSITION	
NAV ANT POSITION	
TURN RATE	
SPEED RATE	
INITIAL SETTING 2 menu	
RADAR PICTURE	Select round or wide type display. round: ◯ wide: ▢

(Continued)

Item	Function
TYPE	R : Regular ; N : Netherland ; and G : German
KEY BEEP	Turn key response beep on or off. Turn OFF for IMO merchant vessels.
SCANNER STOPPED	Set to ST-BY in normal use. Select TX to confirm magnetron heater voltage of 25 kW magnetron, etc.
VIDEO SIGNAL	Set to ANLG in normal use. Select DGTL to adjust QV (quantized video) when the radar is equipped with Auto Plotter ARP-23 (option).
ALARM LEVEL	Set echo strength level which triggers guard alarm. "7" is strongest echo and "4", medium strength echo.
DISPLAY	Select radar display function; main or sub (slave).
DEAD SECTOR	This menu can set two areas where no radar pulse is to be transmitted. Areas in which a strong reflected pulse could damage the receiver or the possibility of health hazard exists should be entered. If there is a large mast at the rear of the scanner, for example, this may produce a wide dead sector on the display. Any target echoes within the area may not show up on the display. Allowing the radar pulse to pass through the body may cause health problems. Therefore, an area where passengers or crew might approach too close to the radiator should be entered. To prevent transmission in area(s), select ON and enter relative bearing range of the area(s) here.
INITIAL SETTING 3 menu	
TRAIL RESTART	Select whether to restart or discontinue echo trailing when changing the range. Set to ON to restart trailing, or OFF to discontinue.

(Continued)

Item	Function
ECHO AVG W/O GYRO	Normally, echo averaging is turned off when there is no gyrocompass connection, because stable picture cannot be obtained. However, it can be turned on with no gyrocompass connection.
CURSOR GYRO SCALE	Scale may be shown in degrees or compass points.
CTR ECHO STRETCH	Set to "ON" to enlarge echo in the range up to the first fixed range ring.
VIDEO CONTRAST	These are set at the factory; do not change them in the field.
MAXIMUM RANGE	
ECHO FULL COLOR	Echo can be presented in multi-color.
INDEX LINES	Number of index line is selectable to 2 or 6.
INITIAL SETTING 4 menu	
MODEL	Select your radar type. This setting changes a set of pulselength, PRF and STC curve.
RJ-5	When optional RJ-5 is connected, set this menu to "ON".
RJ-7	When optional RJ-7 is connected, set this menu to "ON".
INITIAL SETTING 5 menu	
RJ-8	When optional RJ-8 is connected, set this menu to "ON".
CABLE L.	Always set to "500".
FACTORY DEFAULT	Restore all menus' default settings.

After registering settings

Turn off the #4 segment of DIP Switch S1 to close the initial settings menus.

When replacing SPU board

Initial setting data are written to the EEPROM (U47, U48) on the SPU Board. When replacing the SPU Board, exchange the EEPROM on the replacement board with the original EEPROM. Otherwise, the radar operates by default initial settings.

Confirmation of Magnetron Heater Voltage

Overview

Magnetron heater voltage is adjusted at the factory. However, confirm that it is within the prescribed rating.

Procedure

Measure magnetron heater voltage between pins #12(+) and #11(-) of connector P801 on the scanner unit. It should be within the rating noted in the table below.

Condition	FR-2110 (10 kW)	FR-2120 (25 kW)
ST-BY, 0.125 nm, minimum picture brilliance	7.4 V to 7.6 V	8.2 V to 8.4 V
TX*, 120 nm	measurement not required	6.5 V to 7.5 V

If the voltage is not within the prescribed rating, adjust pot. VR801 on the TRIGGER Board (RFC-9008).

* 25 kW radar must be transmitted to check voltage. To do this, open the INITIAL SETTING 2 menu and set "5. SCANNER STOPPED" to "TX". Further, remove the TX high voltage fuse F3 (0.5A, in the display unit) and turn off the SCAN switch in the top right-hand panel on the display unit.

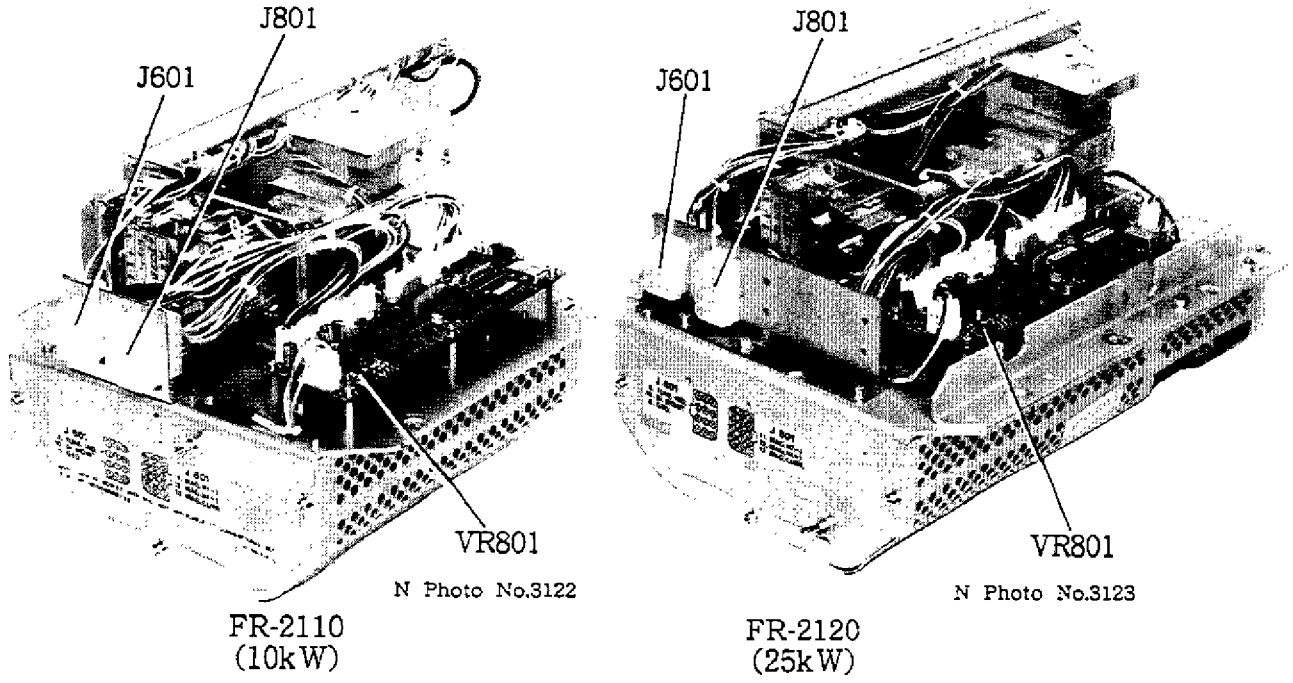


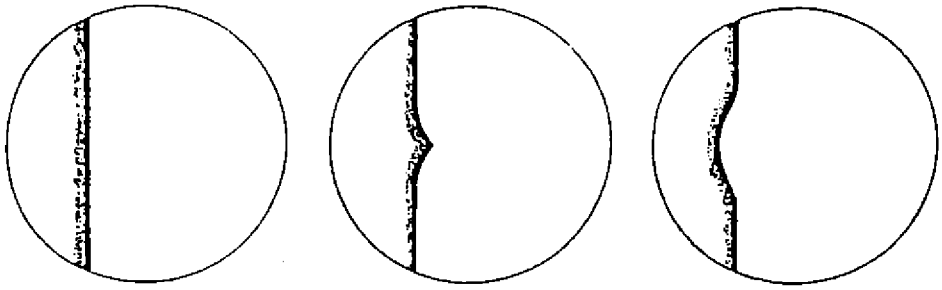
Figure 3-6 Transceiver unit

Adjustment of Sweep Timing

Overview

Sweep timing differs with respect to the length of the signal cable between the scanner unit and the display unit. Adjust sweep timing at installation to prevent the following symptoms:

- The echo of a "straight" target (for example, pier), on the 0.25 mile range, will appear on the display as being pulled inward or pushed outward. See Figure 3-7.
- The range of target echoes will also be incorrectly shown.



(1) Correct (2) Target pushed inward. (3) Target pulled outward.

Figure 3-7 Examples of correct and incorrect sweep timings

Procedure

1) Open INITIAL SETTING 1 menu and select "3. TIMING ADJ".
2) Transmit on the 0.25 mile range.
3) Adjust radar controls to display picture properly.
4) Select an echo which should be displayed straightly. Adjust the VRM rotary control to straighten target echo.

   ■ **NOTE:** *The readout which changes with VRM rotary control operation is unrelated to this adjustment. Please disregard it.*

5) Press the **ENTER** key.

Alignment of Heading

Overview

Scanner unit mounting error (heading reed switch timing error) can be compensated at the display unit.

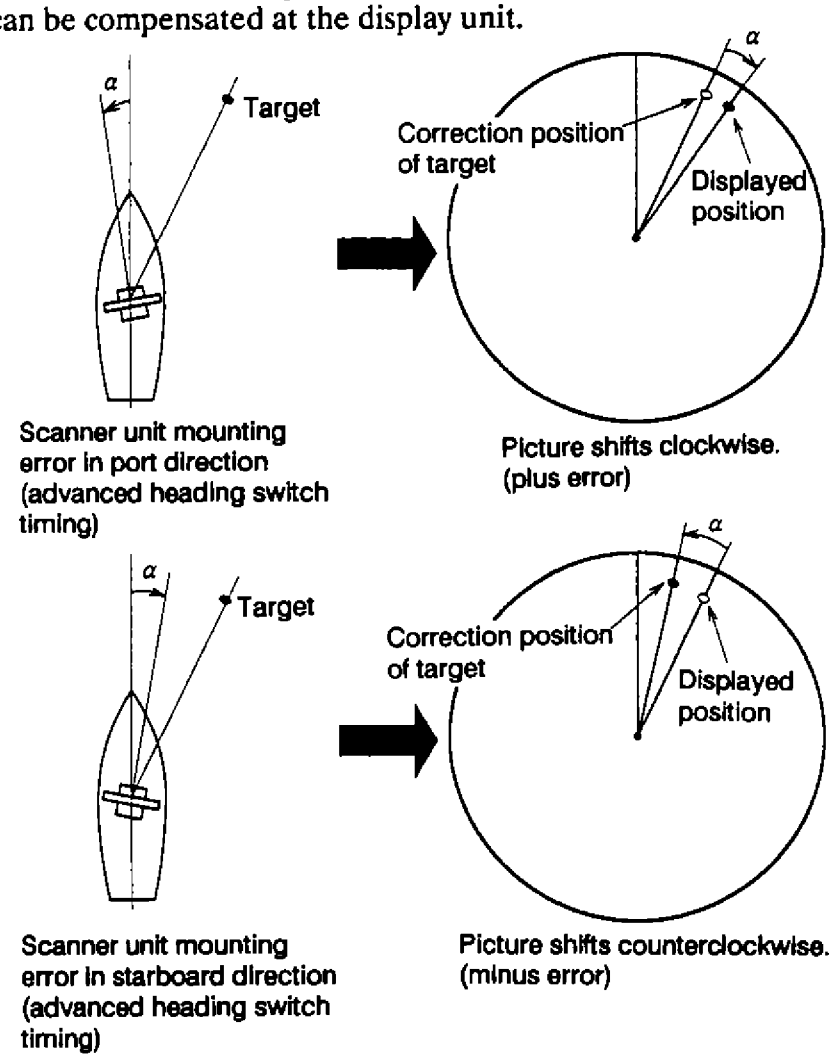


Figure 3-8 Scanner unit mounting error

Procedure

1) Open INITIAL SETTING 1 menu and select "2. HD ALIGN".
2) Operate EBL rotary control to shift target echo to correct position.
3) Press the **ENTER** key.

Adjustment Check List

Confirm completion by ticking boxes.

1 SELECTION OF MERCHANT/FISHING VESSEL SPECIFICATION ☐

Turn off power.
↓
Set #2 of DIP Switch S1 on SPU Board SPU-9111 as follows;
Merchant: OFF
Fishing: ON
↓
OPENING INITIAL SETTINGS MENUS
Turn on #4 of DIP Switch S1.
↓
Turn on power.

After completing all adjustments, turn off #4 of DIP Switch S1.

2 SETTING OF VIDEO STC CURVE (entering antenna height) ☐

Open INITIAL SETTING 1 menu and select "4. ANT HEIGHT".
↓
Enter height of antenna above waterline.
↓
ENTER

3 CONFIRMATION OF MAGNETRON HEATER VOLTAGE (*FR-2120 ONLY) ☐

* **RADAR MENU** ([FUNCTIONS] menu)
↓
* **0** ([SYSTEM SETTING 1] menu)
↓
* **0** ([SYSTEM SETTING 2] menu)
↓
* **2** ([INITIAL SETTING 1] menu)
↓
* **0** ([INITIAL SETTING 2] menu)
↓
* **5** Select "TX".
↓
* **ENTER** (To transmit with scanner rotation suspended.)
↓
* **RADAR MENU** ("ST-BY" display screen)
↓
* Remove fuse F3 (0.5A) on display unit.
↓
Turn off SCAN switch (in top panel).
↓
Open scanner unit cover at stern side.
↓
Measure voltage between #12(+) and #11 (−) of connector P801. It should be 7.4 − 7.6V (8.2 − 8.4V). If not, adjust VR801 on RFC-9008.
↓
* Transmit on 120 mile range.
↓
* Measure voltage between #12(+) and #11(−) of connector P801. Confirm that the voltage is 6.5 − 7.5V.
↓
Close scanner unit cover.
↓
* Turn power switch off.
↓
* Reinsert fuse F3 (0.5A).
↓
Turn power switch on.
↓
* Open INITIAL SETTING 2 menu and set "5. SCANNER STOPPED" to "ST-BY".
↓
Turn on SCAN switch.

4 PRESETTING OF TUNING /TUNING DISPLAY ☐

Set TUNE switch (in top panel) to MANU.
↓
Transmit on 48 mile range.
↓
Observe picture and tune by TUNE control (in top panel).
↓
Set TUNE switch to AUTO. Wait about 10 seconds (four scanner rotations) to find tuning point.
↓
Confirm peak tuning.

5 ADJUSTMENT OF VIDEO AMPLIFIER INPUT LEVEL ☐

Transmit on 12 mile range.
↓
Measure level of strong echo at TP3 on VDA Board (take trigger at TP11). It should be 4.2Vpp. If not, adjust VR1.

6 ADJUSTMENT OF SWEEP TIMING ☐

Open INITIAL SETTING 1 menu and select "3. TIMING ADJ".

↓

Transmit on 0.25 mile range. Select an echo which should be displayed straightly (pier, etc.). Adjust VRM control to straighten echo.

↓

ENTER

7 ALIGNMENT OF HEADING ☐

Check display for error direction;
picture shifted clockwise...plus error
picture shifted counterclockwise...minus error

↓

Open INITIAL SETTING 1 menu and select "2. HD ALIGN".

↓

Operate EBL rotary control to shift target echo to correct position.

↓

ENTER

8 SUPPRESSION OF MAIN BANG ☐

Transmit on 48 mile range for 10 min. Then, adjust sensitivity to show small amount of noise on display.

↓

Change to 0.25 mile range and adjust A/C SEA to suppress sea clutter.

↓

Slowly turn VR301 (MBS-L, in top panel on display unit) clockwise to suppress main bang.

9 SETTING OF FUNCTION KEYS ☐

Assign function (picture setup, specific operation, or watch alarm) according to user's request.

↓

Attach appropriate key label (supplied) to each function key.

10 TURN OFF #4 OF DIP SWITCH S1 ON SPU BOARD ☐

INITIAL SETTINGS MENUS

RADAR MENU → **0** → **0** → **2**

[INITIAL SETTING 1]

1	[SYSTEM SETTING 1]		
2	HD ALIGN		
3	TIMING ADJ		
4	ANT HEIGHT	6M/8M/10M/15M/ 20M/25M/35M MORE	6
5	LOG PULSE	200P/NM	
6	[SHIP INFORMATION]		
7			
8	ON TIME	000000.0	
9	TX TIME	000000.0	
0	[INITIAL SETTING 2]		

0

[INITIAL SETTING 2]

1	[INITIAL SETTING 1]		
2	RADAR PICTURE	**ROUND**/WIDE	
3	TYPE	R/N/G	
4	KEY BEEP	OFF/**ON**	
5	SCANNER STOPPED	**ST-BY**/TX	
6	VIDEO SIGNAL	**ANLG**/DGTL	
7	ALARM LEVEL	4/5/6/7	
8	DISPLAY	**MAIN**/SUB	
9	DEAD SECTOR	OFF/ON	000°~000° 000°~000°
0	[INITIAL SETTING 3]		

0

[INITIAL SETTING 3]

1	[INITIAL SETTING 2]	
2	TRAIL RESTART	OFF/**ON**
3	ECHO AVG W/O GYRO	**OFF**/ON
4	CURSOR GYRO SCALE	**DEG**/8POINT
5	CTR ECHO STRETCH	**OFF**/ON
6	VIDEO CONTRAST	1/2/3/4
7	MAXIMUM RANGE (*)	72/96/120
8		
9		
0	FACTORY DEFAULT	

[SHIP INFORMATION]

1	[INITIAL SETTING 1]		
2	SHIP'S LENGTH	000M	
3	SHIP'S WIDTH	000M	
4	RADAR POSITION	FOR BOW FOR PORT	000M 00M
5	NAV ANT POSITION	FOR BOW FOR PORT	000M 00M
6	TURN RATE	00KT 00.0°/S 00KT 00.0°/S	
7	SPEED RATE	00KT 0.00KT/S 00KT 0.00KT/S	
8			
9			
0			

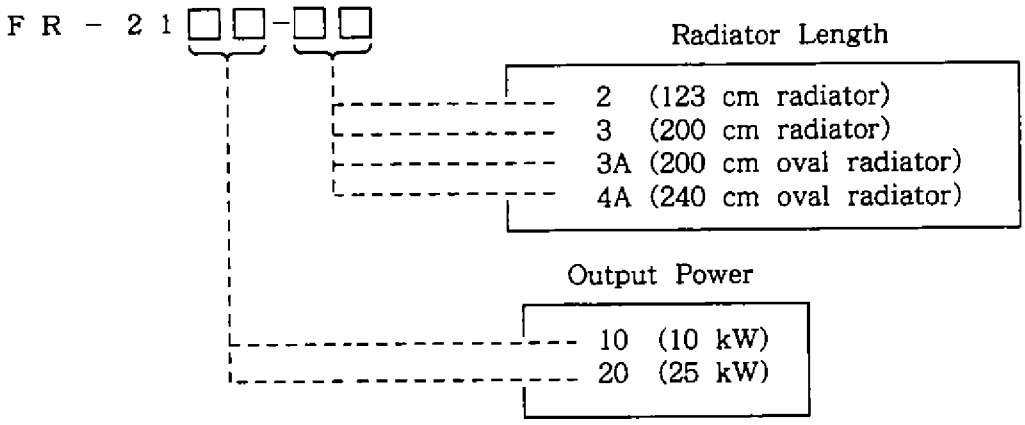
NOTE: *Default settings shown in boldface.*

ON REPLACEMENT OF SPU BOARD

The SPU Board's EEPROMs (U47, U48) store initial setting data. When replacing the board, exchange EEPROMs of replacement board with original EEPROMs. Otherwise the radar operates on default settings.

SYSTEM CONFIGURATION

MODEL NUMBER



COMPLETE SET

No.	Name	Type	Qty	Wt. (kg)	Radiator Length	Model/ Radiator rpm
1	Scanner Unit (including installation materials)	XN2-C2P7N2N-028	1	33	123 cm	FR-2110 24 rpm
		XN3-C2P7N2N-028		37.5	200 cm	
		XN3A-C2P7N2N-028		36.5	200 cm	
		XN4A-C2P7N2N-028		38.5	240 cm	
		XN2-RSB-0063-028		33	123 cm	FR-2110 36 rpm
		XN3-RSB-0063-028		37.5	200 cm	
		XN3A-RSB-0063-028		36.5	200 cm	
		XN4A-RSB-0063-028		38.5	240 cm	
		XN2-RSB-0014-029		35	123 cm	FR-2120 24 rpm
		XN3-RSB-0014-029		40	200 cm	
		XN3A-RSB-0014-029		39	200 cm	
		XN4A-RSB-0014-029		42	240 cm	
		XN2-RSB-0064-029		35	123 cm	FR-2120 36 rpm
		XN3-RSB-0064-029		40	200 cm	
		XN3A-RSB-0064-029		39	200 cm	
		XN4A-RSB-0064-029		42	240 cm	

(Continued)

No.	Name	Type	Qty	Wt. (kg)	Remarks
2	Display Unit	RDP-106	1	100	Console type
				50	Tabletop type
3	Accessories	FP03-04900	1 set		Unibody display unit
		FP03-04910			Separate control unit
4	Installation Materials	CP03-13110	1 set		For scanner unit
		CP03-13120			For display unit
		CP03-13130			For power supply
5	Signal Cable	S03-49-15/20/30	Select length		RW-4873 (no armor)
		S03-50-15/20/30			RW-6895 (with armor)
6	Spare Parts	SP03-09930	1 set		
		SP03-09941	1 set		For FR-2110*
		SP03-09940			For FR-2120*

* Additional parts for type approval set

OPTION

No.	Name	Type	Code No.	Remarks
1	Gyro Converter (1 set)	GC-8	008-446-520	Built in display unit. See page B-1.
2	Video Plotter (1 set)	RP-23	008-446-550	Built in display unit, under development
3	Auto Plotter (1 set)	ARP-23	008-446-530	Built in display unit, under development
4	Non-glare Filter	OP03-111	008-446-640	
5	Display Unit Grip (1 set)	OP03-70	008-423-420	
6	External Buzzer	OP03-21	000-030-097	1 m, with connector
7	Transformer Unit (1 set)	RU-1803	000-030-420	For AC spec., 440 V AC mains
8	Power Cable	CVV-S 8 × 2C	000-560-634	15 m, DC spec.
9	Rectifier (1 set)	RU-3424	000-030-441	DC spec. (for AC mains)
10	Separate Control Unit Kit	OP03-124-1	000-085-719	10 m interconnection cable & cover
11	Range Unit Modification Kit	OP03-110-1	008-446-610	Kilometers
		OP03-110-2	008-452-200	Statute miles
12	AC/DC Modification Kit	OP03-112-1	008-446-620	Converting AC to DC spec.
13	Interswitch	RJ-7		Switching for 4 scanners and 6 displays, under development
14				
15	Radar Slave Display	CD-141		Color
		FMD-8000		Monochrome
16	Display Unit Cover	OP03-94	008-446-480	Tabletop, 2.5G7/2
		OP03-95	008-446-490	Tabletop, 7.5BG7/2
		OP03-96	008-446-500	Console, 2.5G7/2
		OP03-97	008-446-510	Console, 7.5BG7/2
17	Console Kit	OP03-122-1	000-085-711	2.5GY5/1.5
		OP03-122-2	000-085-712	2.5G7/2
		OP03-122-3	000-085-713	7.5BG7/2

FURUNO

CODE NO.	008-459-770	03EU-X-9402-1
TYPE	CP03-14401	

工事材料表 INSTALLATION MATERIALS	FR-2110/2120 FR/FAR-2815/2825 船用レーダー FR-8051/8111/8251 MARINE RADAR (空中線部用 FOR SCANNER UNIT)

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
11	ﾐｶﾞｷ平座金 FLAT WASHER	φ24	M12 SUS304	4	
			CODE NO. 000-864-132		
12	ﾊﾞﾈ座金 SPRING WASHER	22	M12 SUS304	4	
			CODE NO. 000-864-263		
13	防食ｺﾞﾑ 1 CORROSION-PROOF RUBBER MAT(1)	310 310 t=1	03-001-3001-0 CR	1	
			CODE NO. 300-130-010		
14	ｼｰﾙｳｫｯｼｬｰ SEAL WASHER	φ30	03-001-3002-0	4	
			CODE NO. 300-130-020		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

(略図の寸法は、参考値です。)

図番 (2/2)
DWG. NO. C3418-M02-B

FURUNO ELECTRIC CO., LTD

FURUNO

CODE NO.	008-459-770	03EU-X-9401-1
TYPE	CP03-14401	

工事材料表 INSTALLATION MATERIALS	FR-2110/2120 FR/FAR-2815/2825 船用レーダー FR-8051/8111/8251 MARINE RADAR (空中線部用 FOR SCANNER UNIT)

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	圧着端子 CRIMP-ON LUG	16 6	FVD1.25-3 アカ RED	1	
			CODE NO. 000-116-634		
2	圧着端子 CRIMP-ON LUG	19 7	FV1.25-M3 アカ RED	26	
			CODE NO. 000-538-110		
3	圧着端子 CRIMP-ON LUG	26 10	FV5.5-4 キ YEL	2	
			CODE NO. 000-538-123		
4	アース線 GROUNDING WIRE	320	RW-4747 (IV-8 ∗0.32M∗)	1	
			CODE NO. 000-566-000		
5	六角ﾎﾞﾙﾄ1種 HEX. BOLT	25 φ6	M6X25 SUS304	1	
			CODE NO. 000-862-180		
6	六角ﾅｯﾄ 1種 HEX. NUT	12 5	M6 SUS304	1	
			CODE NO. 000-863-109		
7	ﾐｶﾞｷ平座金 FLAT WASHER	φ12	M6 SUS304	3	
			CODE NO. 000-864-129		
8	ﾊﾞﾈ座金 SPRING WASHER	12	M6 SUS304	1	
			CODE NO. 000-864-260		
9	六角ﾎﾞﾙﾄ 1種 HEX. BOLT	60 φ12	M12X60 SUS304 ﾋﾞﾝﾈｼﾞ FULL THREADED	4	
			CODE NO. 000-862-191		
10	六角ﾅｯﾄ 1種 HEX. NUT	22 10	M12 SUS304	4	
			CODE NO. 000-863-112		

(略図の寸法は、参考値です。)

図番 (1/2)
DWG. NO. C3418-M01-B

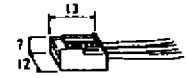
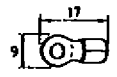
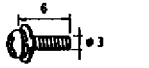
FURUNO ELECTRIC CO., LTD

FURUNO

CODE NO.	008-446-460	03EM-X-9404-8
TYPE	CP03-13120	

工事材料表
INSTALLATION MATERIALS

FR-2150/2150W
FR-2110/2120/2120W　レーダー
FR-2130S/2130SW/2160DS　RADAR
FR-2160SW(指示部用 FOR DISPLAY UNIT)

番号 No.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 Q'TY	用途/備考 REMARKS
11	VHコネクタ組品 CONNECTOR ASSY.		03-1738(3P) CODE NO. 008-454-390	1	ジャイロコンバータ用 FOR GYRO CONVERTER
12	圧着端子 CRIMP-ON LUG		8NK4 CODE NO. 000-538-180	2	DC電源接続用 FOR DC MAINS CONNECTION
13	ナベセムスネジB WASHER HEAD SCREW		M3X8 C2700W MBNI2 CODE NO. 000-881-404	2	
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

(略図の寸法は、参考値です。)

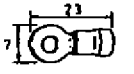
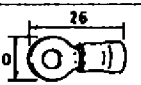
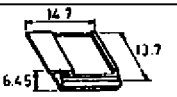
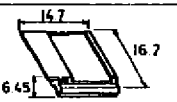
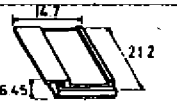
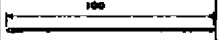
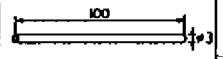
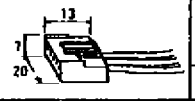
図番 (2/2)
DWG. NO. C3382-M04-J

FURUNO

CODE NO.	008-446-460	03EM-X-9403-7
TYPE	CP03-13120	

工事材料表
INSTALLATION MATERIALS

FR-2150/2150W
FR-2110/2120/2120W
FR-2130S/2130SW/2160DS
FR-2160SW(指示部用 FOR DISPLAY UNIT)

番号 No.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 Q'TY	用途/備考 REMARKS
1	圧着端子 CRIMP-ON LUG		FV5.5-S4 ＊ YEL CODE NO. 000-538-121	2	AC電源接続用 FOR AC MAINS CONNECTION
2	圧着端子 CRIMP-ON LUG		FV5.5-4 ＊ YEL CODE NO. 000-538-123	8	トランス/整流器用 FOR XFORMER OR RECTIFIER
3	NHコネクタハウジング NH CONNECTOR HOUSING		H2P-SHF-AA CODE NO. 000-505-595	1	外部機器接続用 FOR EXTERNAL EQUIPMENT
4	NHコネクタハウジング NH CONNECTOR HOUSING		H3P-SHF-AA CODE NO. 000-505-596	3	外部機器接続用 FOR EXTERNAL EQUIPMENT
5	NHコネクタハウジング NH CONNECTOR HOUSING		H4P-SHF-AA CODE NO. 000-505-597	3	外部機器接続用 FOR EXTERNAL EQUIPMENT
6	NHコネクタハウジング NH CONNECTOR HOUSING		H5P-SHF-AA CODE NO. 000-505-598	3	外部機器接続用 FOR EXTERNAL EQUIPMENT
7	NHコネクタハウジング NH CONNECTOR HOUSING		H7P-SHF-AA CODE NO. 000-505-600	1	外部機器接続用 FOR EXTERNAL EQUIPMENT
8	NHコネクタ ＊センサイ＊ NH CONNECTOR ASSY.		AWG24 ＊0.1M＊ NHコンタクトツキ CODE NO. 000-132-342	20	外部機器接続用 FOR EXTERNAL EQUIPMENT
9	スミチューブF(Z) HEAT-SHRINK TUBE		3X0.25 クロ BLACK CODE NO. 000-105-874	2	外部機器接続用 FOR EXTERNAL EQUIPMENT
10	VHコネクタ組品 CONNECTOR ASSY.		03-1737(5P) CODE NO. 008-454-380	1	ジャイロコンバータ用 FOR GYRO CONVERTER

(略図の寸法は、参考値です。)

図番 (1/2)
DWG. NO. C3382-M03-H

FURUNO

CODE NO.		03EM-X-9405
TYPE		

工事材料表 INSTALLATION MATERIALS	FR-2110/2120 レーダー RADAR (信号ケーブル SIGNAL CABLE)		

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	信号ケーブル組品 SIGNAL CABLE ASSEMBLY	 L=15m	S03-49-15 (RW-4873 *15M*) CODE NO. 008-446-390	1	選択 TO BE SELECTED
1	信号ケーブル組品 SIGNAL CABLE ASSEMBLY	 L=20m	S03-49-20 (RW-4873 *20M*) CODE NO. 008-446-400		
1	信号ケーブル組品 SIGNAL CABLE ASSEMBLY	 L=30m	S03-49-30 (RW-4873 *30M*) CODE NO. 008-446-410		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

図番 DWG. NO.	(1/1) C3382-M05-A

FURUNO ELECTRIC CO., LTD

FURUNO

CODE NO.		03EM-X-9406
TYPE		

工事材料表 INSTALLATION MATERIALS	FR-2110/2120 レーダー RADAR (信号ケーブル SIGNAL CABLE)		

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	信号ケーブル組品 SIGNAL CABLE ASSEMBLY	 L=15m	S03-50-15 (RW-6895 *15M*) CODE NO. 008-446-420	1	選択 TO BE SELECTED
1	信号ケーブル組品 SIGNAL CABLE ASSEMBLY	 L=20m	S03-50-20 (RW-6895 *20M*) CODE NO. 008-446-430		
1	信号ケーブル組品 SIGNAL CABLE ASSEMBLY	 L=30m	S03-50-30 (RW-6895 *30M*) CODE NO. 008-446-440		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

型検1種、型式承認甲種
(FOR TYPE APPROVED SET)

図番 DWG. NO.	(1/1) C3382-M06-A

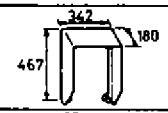
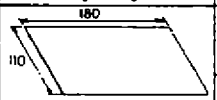
FURUNO ELECTRIC CO., LTD

FURUNO

CODE NO.	000-085-592	03EM-K-9503-1
TYPE	FP03-05000	

付属品表
ACCESSORIES

FR-2110/2120 レーダー
FR-2150/2150W
FR-2120W/2160DS RADAR

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	フード組品 HOOD ASSY.		FP03-04910 CODE NO. 008-446-330	1	
2	ユーザーキーSWシート(E) KEY LABEL(E)		03-123-0202 CODE NO. 100-200-470	1	
3	ダストカバー(2100) DUST COVER		03-123-0211 CODE NO. 100-201-050	1	
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

008-446-350
FP03-05030

英文／卓上型指示器（操作パネル一体型）
英文／コンソール型指示器
ENGLISH / TABLETOP (PANEL FITTED)
ENGLISH / CONSOLE

図番 (1/1)
DWG. NO. C3382-F03-D

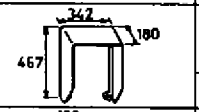
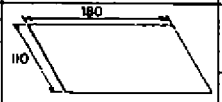
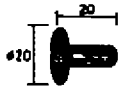
FURUNO ELECTRIC CO., LTD

FURUNO

CODE NO.	000-085-718	03EM-X-9504-1
TYPE	FP03-05020	

付属品表
ACCESSORIES

FR-2110/2120 レーダー
FR-2150/2150W
FR-2120W/2160DS RADAR

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	フード組品 HOOD ASSY.		FP03-04910 CODE NO. 008-446-330	1	
2	ユーザーキーSWシート(E) KEY LABEL(E)		03-123-0202 CODE NO. 100-200-470	1	
3	ホールプラグ HOLE PLUG		NO. 4567 CODE NO. 000-800-729	4	
4	ダストカバー(2100) DUST COVER		03-123-0211 CODE NO. 100-201-050	1	
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

008-451-630
FP03-05040

英文／卓上型指示器（操作パネル分離型）
ENGLISH / TABLETOP (PANEL SEPARATED)

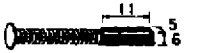
図番 (1/1)
DWG. NO. C3382-F04-D

FURUNO ELECTRIC CO., LTD

FURUNO

CODE NO.	008-418-920	03DX-X-9303-4
TYPE	SP03-08902	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	FR-1410/1425/2110/2120 FCR-1401/1411/1421 MARK-3 FR/FAR-2815/2825 レーダー RADAR	空中線部予備品 FOR SCANNER UNIT	

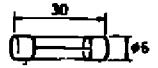
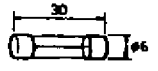
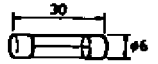
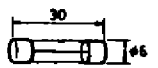
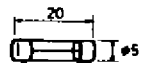
ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES.	QUANTITY SPARE	REMARKS/CODE NO.
1	カーボンブラシ CARBON BRUSH		MG120 -5X6X11 D8G	2		2	000-631-716

MFR'S NAME FURUNO ELECTRIC CO., LTD DWG. NO. C3352-P04-E 1/1

FURUNO

CODE NO.	008-446-300	03EM-X-9301-2
TYPE	SP03-09930	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	FR-2130S FR-2110/2120 レーダー RADAR		

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES.	QUANTITY SPARE	REMARKS/CODE NO.
1	管入りヒューズ GLASS TUBE FUSE		FGBO 20A AC125V	2		4	000-549-015
2	管入りヒューズ GLASS TUBE FUSE		FGBO 0.5A AC250V	3		6	000-549-018
3	管入りヒューズ GLASS TUBE FUSE		FGBO 5A AC250V	3		6	000-549-022
4	管入りヒューズ GLASS TUBE FUSE		FGBO 10A AC125V	2		4	000-549-065
5	ヒューズ FUSE		FGMB 2A AC250V	4		4	000-122-000

MFR'S NAME FURUNO ELECTRIC CO., LTD DWG. NO. C3382-P01-C 1/1

Appendix A—INITIALIZATION OF GYRO CONVERTER GC-8

Gyro Converter GC-8, incorporated inside the radar display unit, converts analog gyrocompass reading into digital coded bearing data for display on the radar display.

This appendix explains how to set up the GC-8 according to the make and specifications of the gyrocompass connected.

Connection of External Power Supply

Overview

Connect an external power supply when the repeater signal is step-by-step type and the step voltage is below 20 V or output voltage is less than 5 W.

Jumper wire

Remove jumper wire JP1 when connecting an external power supply. Refer to page A-9.

Connections

Connect gyrocompass cable and power cable as shown in Figure A-1.

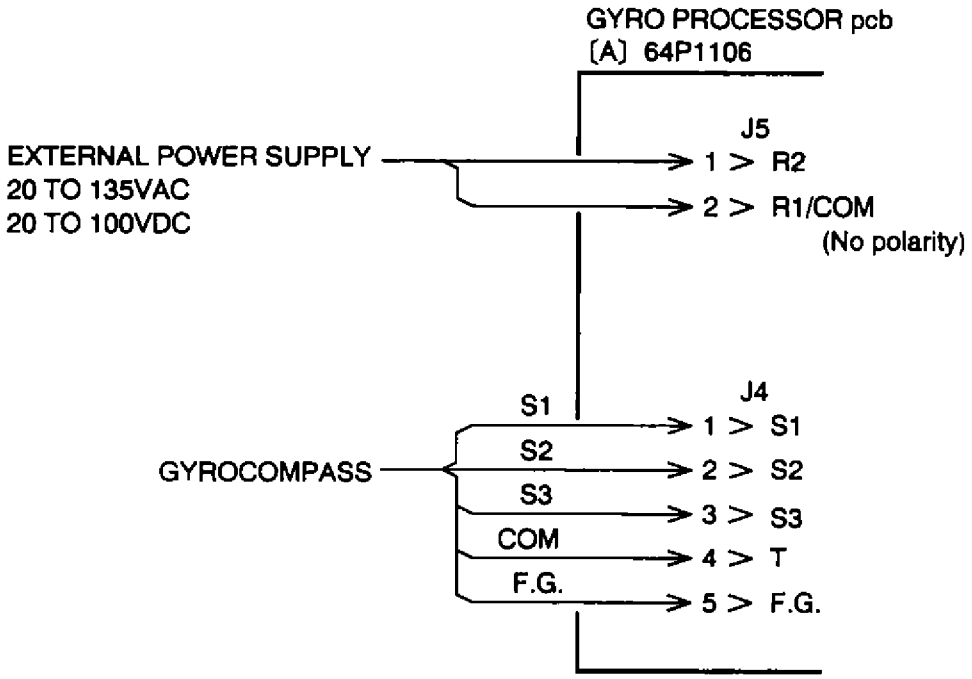


Figure A-1 Connection of external power supply

Setting of DIP Switches and Jumper Wires

Compatible gyrocompasses

The GC-8 is compatible with most gyrocompasses by means of its DIP switches and jumper wires on the GYRO PROCESSOR Board. Below are the gyrocompass specifications it can accommodate.

AC synchro

Frequency: 50/60 Hz, 400 Hz, 500 Hz
Rotor Voltage: _____ VAC
Stator Voltage: _____ VAC
Gear Ratio: 360×, 180×, 90×, 36×

DC synchro

Rotor Voltage: _____ VDC
Stator Voltage: _____ VDC
Gear Ratio: 360×, 180×, 90×, 36×

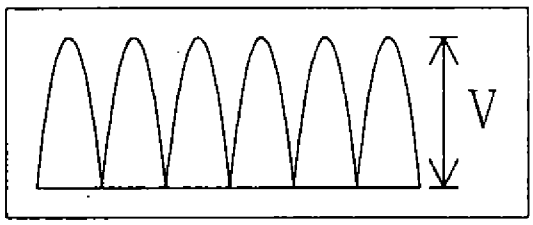
DC step-by-step

Supply Voltage: _____ VDC
Gear Ratio: 360×, 180×, 90×, 36×

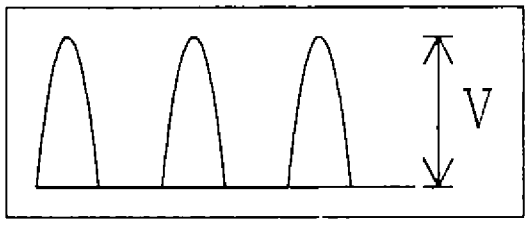
Full- Half-wave pulsating step-by-step

Frequency: 50/60 Hz, 400 Hz, 500 Hz
Supply Voltage: _____ VDC
Gear Ratio: 360×, 180×, 90×, 36×

Full-wave pulsating current



Half-wave pulsating current



Default settings

In the default settings all DIP switches are off and all jumpers wires are set to "#1". (Note that jumper wire JP1's setting is #1, #2, #3.) In those conditions the gyrocompass having the following specifications can be directly connected without further modification.

Gyrocompass:	AC synchro
Frequency:	50/60 Hz
Rotor voltage:	60 to 135 VAC
Stator voltage:	60 to 135 VAC
Gear ratio:	360×
Supply voltage:	30 to 135 VAC

Setting procedure

If the gyrocompass specifications differ from those shown above, set DIP switches and jumper wires as follows.

1) Gyrocompass type

Gyrocompass	SW1-4	SW1-5	SW1-6	JP1
AC Synchro	OFF	OFF	OFF	#1, #2, #3
DC Synchro	OFF	OFF	OFF	#2, #3, #4
DC step-by-step	ON	OFF	OFF	#4, #5, #6
Full-wave pulsating step-by-step	OFF	ON	OFF	#4, #5, #6
Half-wave pulsating step-by-step	ON	ON	OFF	#4, #5, #6

2) Frequency

Frequency	SW1-7	SW1-8	Remarks
50/60 Hz	OFF	OFF	AC synchro, pulsating step-by-step
400 Hz	ON	OFF	AC synchro, pulsating step-by-step
500 Hz	OFF	ON	AC synchro, pulsating step-by-step
DC	ON	ON	DC synchro, DC step

3) Rotor voltage (measured between R1 and R2)

This step is for the AC synchro gyrocompass. For DC synchro gyrocompass go to step 6.

Rotor Voltage	SW2-1	JP3
20 to 45 VAC	ON	#2
30 to 70 VAC	OFF	#2
40 to 90 VAC	ON	#1
60 to 135 VAC	OFF	#1

(continued on next page)

4) Stator voltage (measured between S1 and S2)

Stator Voltage	SW2-2	SW2-3	JP2
20 to 45 VAC or 20 to 60 VDC	ON	OFF	#2
30 to 70 VAC or 40 to 100 VDC	OFF	OFF	#2
40 to 90 VAC	ON	OFF	#1
60 to 135 VAC	OFF	OFF	#1

5) Gear ratio

Gear Ratio	SW1-1	SW1-2	SW1-3
360×	OFF	OFF	OFF
180×	ON	OFF	OFF
90×	OFF	ON	OFF
36×	ON	ON	OFF

6) Power supply voltage

Voltage	JP4	JP5
20 to 45 VAC or 20 to 60 VDC	#2	#2
30 to 135 VAC or 40 to 100 VDC	#1	#1

7) Data transmitting interval of NMEA 0183

Set according to specifications of equipment which is to receive A/D converter data.

Transmitting Interval	SW2-4
2 seconds	ON
1 second	OFF

8) Data transmitting interval of format AD-10

Select data transmitting interval of ports 1 to 6 by jumper wire JP6, JP7.

■ **NOTE:** *The transmitting interval is available in 25 msec or 200 msec. 25 msec is for radar only. 200 msec is for all other equipment.*

Setting by make and model of gyrocompass

The table below shows how to set the GC-8 for connection with various makes and models of gyrocompasses.

Revised at Feb. 1, 1996

Maker	Models	Specification	SW 1-1	SW 1-2	SW 1-3	SW 1-4	SW 1-5	SW 1-6	SW 1-7	SW 1-8	SW 2-1	SW 2-2	SW 2-3	JP1	JP2	JP3	JP4	JP5
FURUNO	GY-700	DC step 100V 180x 5-wire, open collector	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1
Anschutz	Standard 2,3	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 22V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	#1, #2,#3	#2	#2	#1	#1
	Standard 4,6	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 90V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#2	#1	#1	#1
	Standard 20	DC step 35V 180X COM(-) 3-wire (+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2
Yokogawa Navtec (Plaith type)	C-1/1A/2/3 A-55, B-55	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 22V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	#1, #2,#3	#2	#2	#1	#1
	CMZ-250X/ 300X/500	DC synchronous 360X	OFF	OFF	OFF	OFF	OFF	OFF	O N	ON	-	ON	OFF	Remove	#2	-	*	*
		DC step 35V 180X COM (+) 3-wire (-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2
	CMZ-100/200/ 300 C-1Jr,D-1Z/1/ 3 IPS-2/3	AC synchronous 50/60Hz Rotor voltage: 100V Stator voltage: 90V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	CMZ-50 Note 2	step 35V 180X COM (+) 3-wire (-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	Remove	#2	-	*	*
Plaith	NAVGAT II/III	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 68V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#2	#2	#1	#1
Tokimec (Sperry type)	ES-1/2/11 GLT-101/102/ 103/106K/107	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 90V 36x	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	ES-11A/110 TG-200 PR222R/2000 PR237L/H GM 21	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 22V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	MK-14 MOD-1/2/T NK-EN,NK-EI	DC step 70V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1
	SR-130/140	DC step 70V 180x 5-wire, open collector	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1
	TG-100/5000 PR-357/130/ 140, ES-17 GLT-201/202/ 203	DC step 70V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1
	TG-6000	DC step 24V 180x	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2
	GM-11	AC synchronous 50/60Hz Rotor voltage: 100V Stator voltage: 90V 90X	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	SR-120,ES-16 MK-10/20/30	DC step 35V 180x	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2
Kawasaki	GX-81	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 90V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
Armabrown	MK-10,MKL-1 SERIES1351, MOD-4	DC step 50V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1
Robertson	SKR-80	DC step 35V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2

Note1) *: Set JP4 and JP5 according to the voltage of the external power supply.
Note 2) If CMZ-50 has 35VDC, set JP1 to #4, #5, #6.

Function of DIP switches and jumper wires

The function of each DIP switch and jumper wire is as shown in the table which follows. Set them according to the specifications of the gyrocompass connected. After changing settings, turn off the power, or turn on and off SW2-8 to reset the CPU.

DIP switch SW1

Segment	Function	Setting			
SW1-1,-2, -3	Gear ratio	SW1-1	SW1-2	SW1-3	
		OFF	OFF	OFF	360×
		ON	OFF	OFF	180×
		OFF	ON	OFF	90×
		ON	ON	OFF	36×
SW1-4, -5, -6	Type of gyrocompass	SW1-4	SW1-5	SW1-6	
		OFF	OFF	OFF	AC synchro
		OFF	OFF	OFF	DC synchro
		ON	OFF	OFF	DC step
		OFF	ON	OFF	Full-wave pulsating step-by-step
		ON	ON	OFF	Half-wave pulsating step-by-step
SW1-7, -8	Frequency	SW1-7	SW1-8		
		OFF	OFF	50/60 Hz	
		ON	OFF	400 Hz	
		OFF	ON	500 Hz	
		ON	ON	DC	

DIP switch SW2

Segment	Function	Setting		
SW2-1	Rotor voltage	SW2-1		
		ON	20 to 45 VAC	
		OFF	30 to 70 VAC	
		ON	40 to 90 VAC	
		OFF	60 to 135 VAC	
SW2-2, -3	Stator voltage	SW2-2	SW2-3	
		ON	OFF	20 to 45 VAC
		OFF	OFF	30 to 70 VAC
		ON	OFF	40 to 90 VAC
		OFF	OFF	60 to 135 VAC
		ON	OFF	20 to 60 VDC
		OFF	OFF	40 to 100 VDC
SW2-4	NMEA0183 output interval	SW2-4		
		ON	2 seconds	
		OFF	1 second	
SW2-5	Self test	SW2-5		
		ON	self test on	
		OFF	self test off	
SW2-6, -7	Not used			
SW2-8	CPU reset	normally off; turn on and off to reset CPU.		

Jumper wire JP1

Segment	Function	Setting
#1, #2, #3 #2, #3, #4 #4, #5, #6	Type of gyrocompass	AC synchro DC synchro DC step

Jumper wire JP2

Segment	Function	Setting
#2 #1	Stator voltage	20 to 70 VAC, or 20 to 100 VDC 40 to 135 VAC

Jumper Wire JP3

Segment	Function	Setting
#2 #1	Rotor voltage	20 to 70 VAC 40 to 135 VAC

Jumper Wire JP4

Segment	Function	Setting
#2 #1	Supply voltage	20 to 45 VAC, or 20 to 60 VDC 30 to 135 VAC or 40 to 100 VDC

Jumper Wire JP5

Segment	Function	Setting
#2 #1	Supply voltage	20 to 45 VAC, or 20 to 60 VDC 30 to 135 VAC, or 40 to 100 VDC

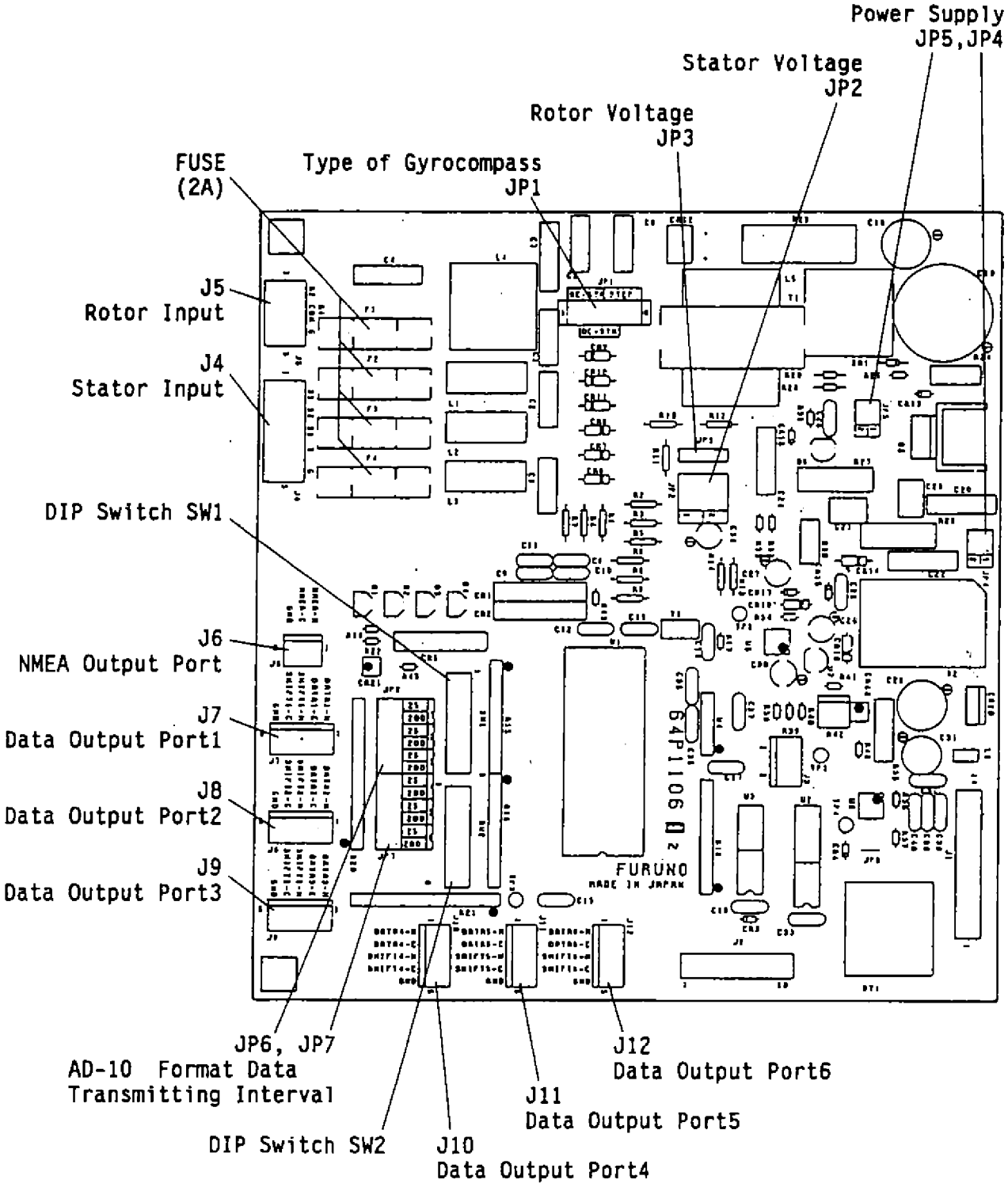


Figure A-2 GYRO PROCESSOR Board

Setting of Bearing

Procedure

Confirm that the gyrocompass is giving reliable readings. Then, set bearing on the radar display as shown in the procedure below. Once you set the bearing, re-setting of it is not usually required. However, always check the reading for accuracy before embarking. If it is in error, correct it by [+] and [–] in the top panel on the display unit.

1) Open the top panel on the display unit. Press the HOLD switch to disengage the computing circuit from the gyrocompass. The "HOLD" LED lights.

2) Press [+]/[–] switches to duplicate the gyrocompass reading at the top of the radar display. (Each press of those switches changes the readout by 0.1 degrees. Press and hold down one of the switches more than two seconds to change the readout by one degree.)

3) Press the HOLD switch when the gyrocompass reading on the radar matches the gyrocompass reading. The "HOLD" LED extinguishes.

■ **NOTE:** *In some cases, the gyrocompass rotation may be the opposite of the displayed bearing, in spite of correct connections. In this case try exchanging two connections among S1, S2 and S3 on the GYRO SWITCH Board.*

Appendix B – INSTALLING GYRO CONVERTER GC-8

The optional gyro converter kit, GC-8 (code no. 008-446-520) is needed for the connection of a gyrocompass. The GYRO PROCESSOR board A64P1106, which the gyro signal is connected to, is mounted inside the display unit as shown in Fig. B-1. Use the board and the label (DIP switch setting table) in the kit; other parts are not used.

Factory-wired are two interconnection cables from J446 on the INT board and J320 on the PAR board. 14 pin- and 5 pin-connectors (the ends of the interconnection cables) are found just above the GYRO PROCESSOR board fixed.

Solder 5 pin- and 3 pin- NH connector assemblies to the multicore cable from the Gyrocompass, and connect them to the GYRO PROCESSOR board.

The NH connector assemblies are supplied as a display installation material.

Attach the label onto the back of the display top cover.

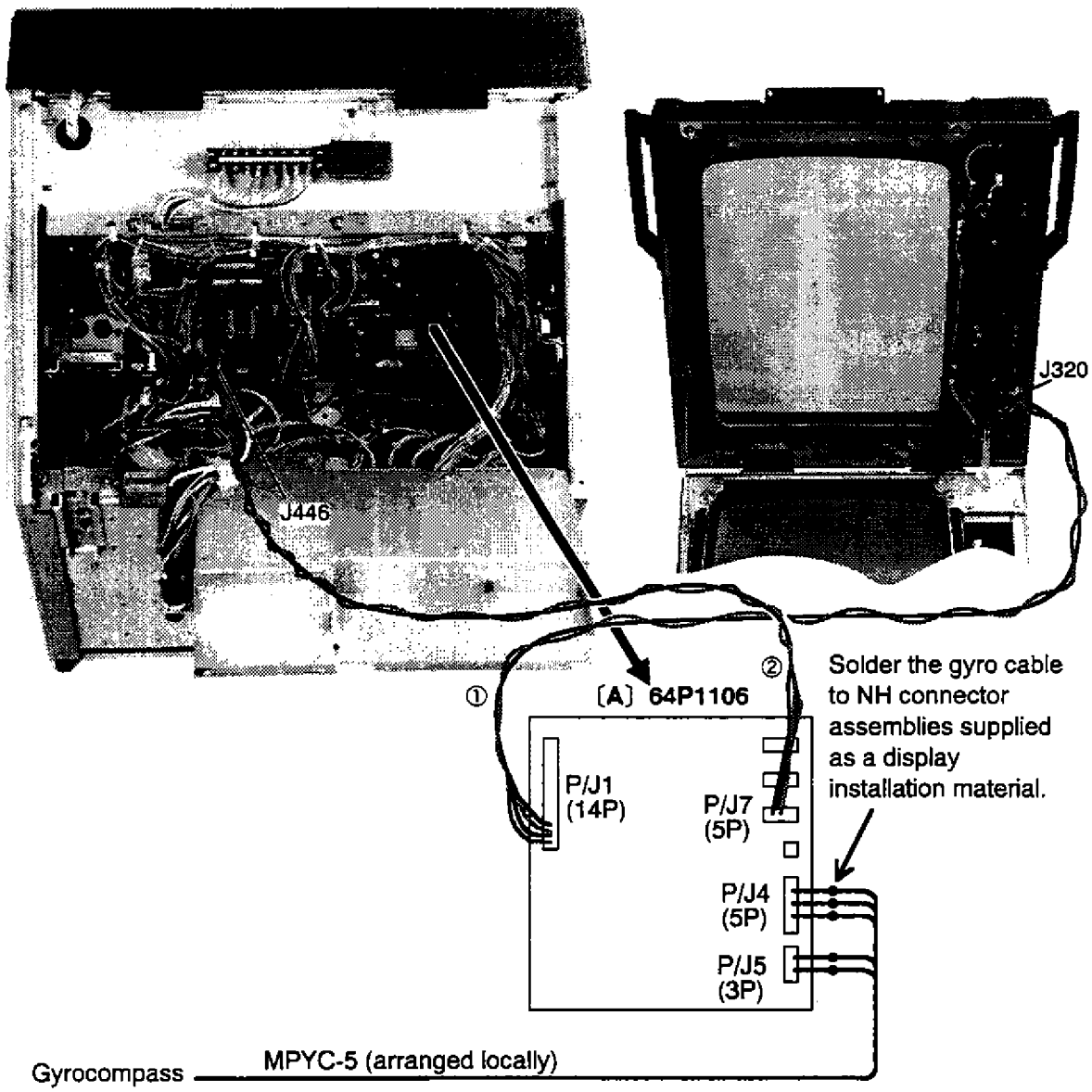
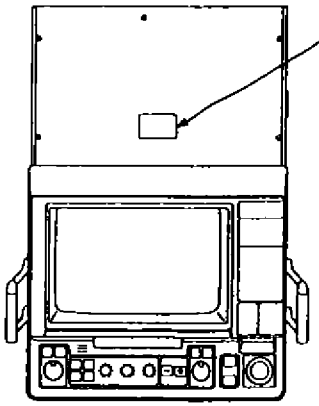
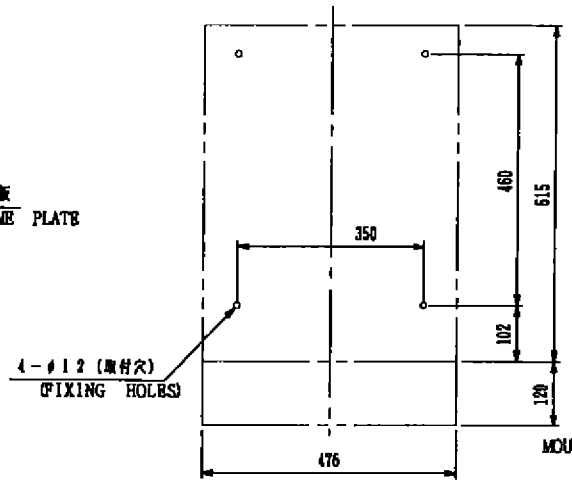


Figure B-1 Installation of GC-8

TABLE OF DRAWINGS

FURUNO

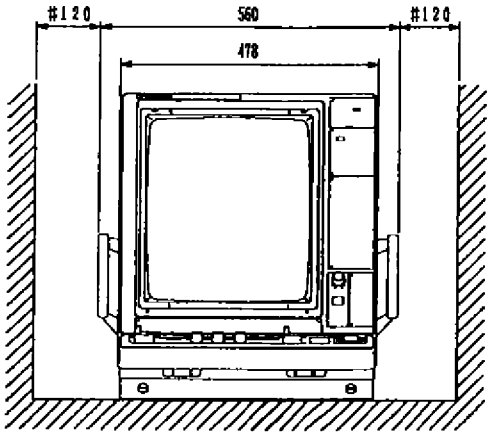


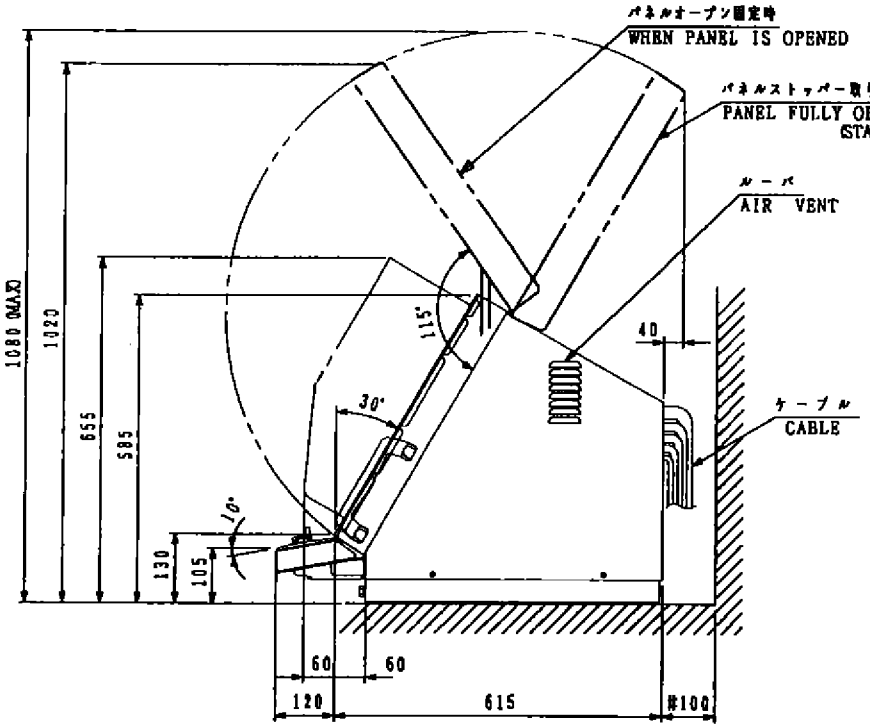


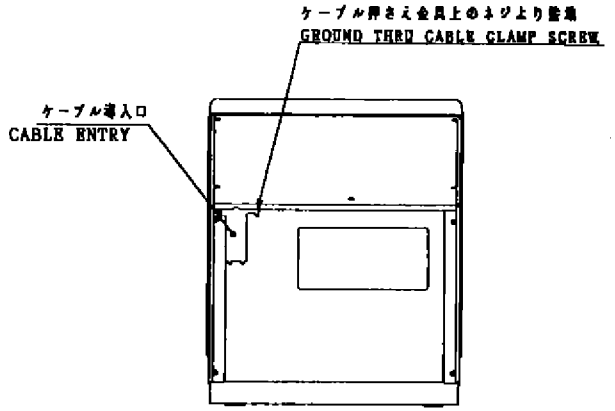
取付寸法図（矢視 A）
MOUNTING DIMENSION (VIEWING A)

注　記
1) 接続ケーブルはサービス時、指示部を前方に充分引き出せるよう余裕を持たせること。
2) 取付用ネジはM10ボルトまたはコーチボルト呼び径9を使用のこと。
3) #印寸法は最小サービス空間寸法とする。

NOTE
1) SUFFICIENT EXTRA CABLINGS SHOULD BE ALLOWED AT THE BACK OF THE UNIT SO THAT THE UNIT CAN BE DRAWN OUT WITH THE CABLES CONNECTED FOR MAINTENANCE.
2) USE M10 BOLTS OR #9 COACH SCREWS FOR FIXING THE UNIT.
3) # : RECOMMENDED SERVICING CLEARANCE.







DRAWN	Mar 14 '77 T. Yamasaki	FR-2110/2120/2120W FR-2130S/2130SW	TITLE RDP-106
CHECKED	mar. 14 '77 I. Shizuo	FR-2150/2150W FR-2160DS/2160SW	名事 指示部（卓上据付）
APPROVED	mar. 17. '77	FR-2120Z	外寸図
SCALE	MASS 56 kg		NAME DISPLAY UNIT (TABLETOP MOUNT)
DWG No.	C3382-G01-G		OUTLINE DRAWING

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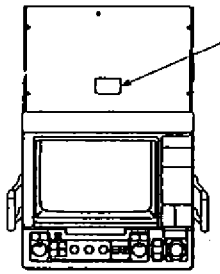
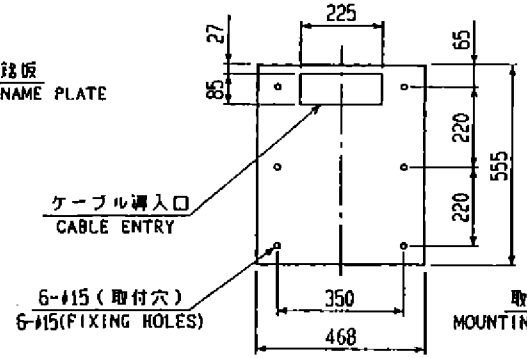
FURUNO



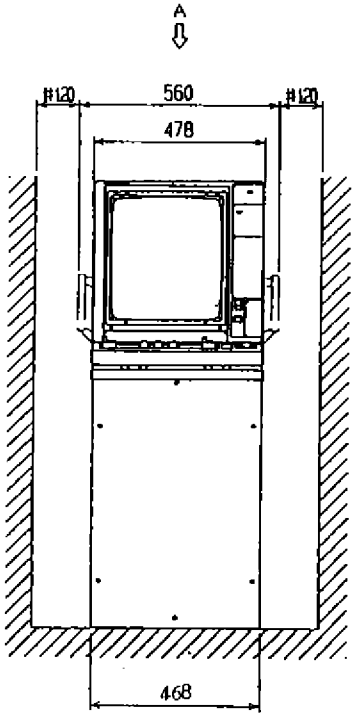


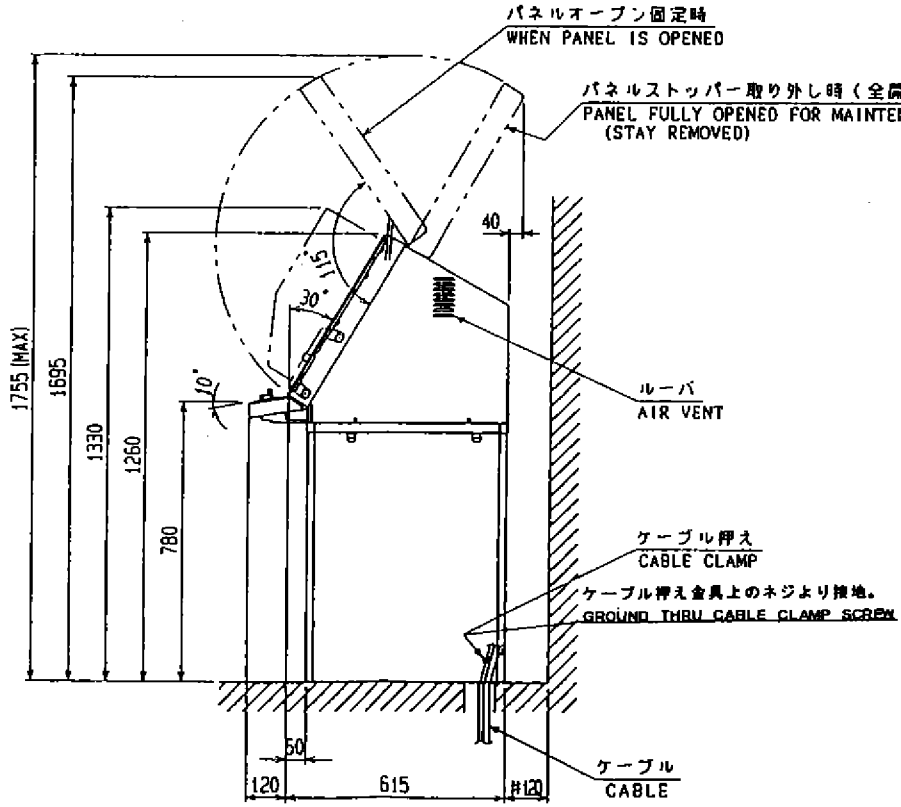
注　記　1）装備ケーブルの端末処理は　装備要領書参照のこと。
2）取付用ネジはM12ボルトまたはコーチボルト呼び径12を使用のこと。
3）＃印寸法は最小サービス空間寸法とする。
4）指定外の寸法公差は、表1による

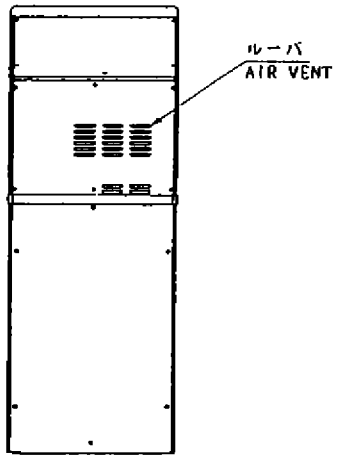
NOTE　1）REFER TO INSTALLATION INSTRUCTIONS FOR CABLE TERMINATION PROCEDURE.
2）USE M12 BOLTS OR φ12 COACH SCREWS FOR FIXING THE UNIT.
3）＃：RECOMMENDED SERVICING CLEARANCE.
4）TABLE 1 SHOWS TOLERANCE OF DIMENSIONS.

範囲	公差
L≦50	±1mm
50<L≦100	±2mm
100<L≦500	±3mm
500<L≦1000	±4mm
1000<L≦2000	±5mm
2000<L≦4000	±7mm
4000<L≦8000	±10mm
8000<L	±15mm

表1
TABLE 1

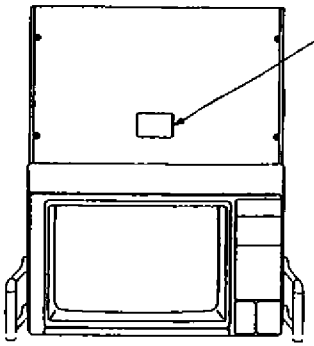


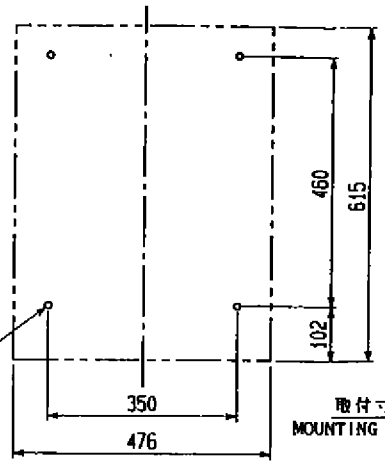




DRAWN May 13 '97 T. YAMASAKI	FR-2160DS/SW FR-2150/W FR-2130SW FR-2130S FR-2120/W FR-2110	TYPE	RDP-106
CHECKED May 13 '97 K. KUSUNOKI		名称	指示器（コンソール型） 外寸図
APPROVED May 13 '97 K. KUSUNOKI			
SCALE	MASS 7.9 kg	APPLICABLE TO: (MODEL)	BLOCK NO.
DWG NO. C3382-G02- G	03-123-1300- 1	NAME	DISPLAY UNIT(CONSOLE TYPE) OUTLINE DRAWING

FURUNO

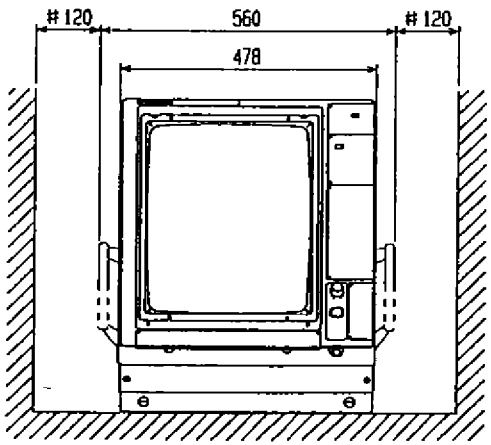


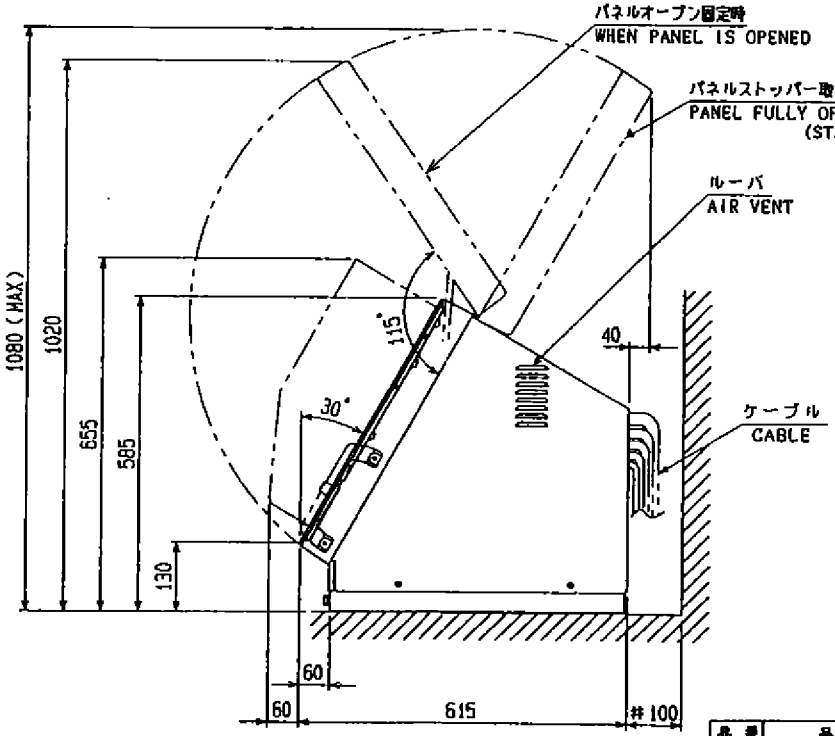


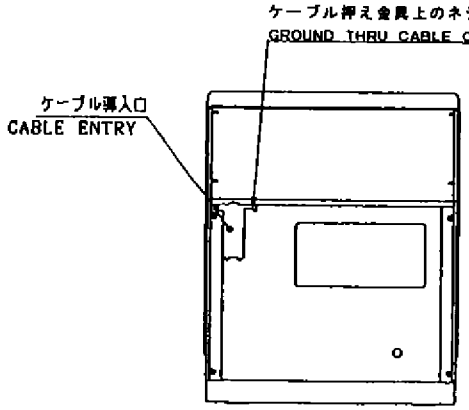
取付寸法図（矢視 A）
MOUNTING DIMENSION (VIEWING A)

注　記
1）装備ケーブルはサービス時、指示部を前方に充分引き出せるよう余裕を持たせること。
2）取付用ネジはM10ボルトまたはコーチボルト呼び径9を使用のこと。
3）#印寸法は最小サービス空間寸法とする。

NOTE
1) SUFFICIENT EXTRA CABLINGS SHOULD BE ALLOWED AT THE BACK OF THE UNIT SO THAT THE UNIT CAN BE DRAWN OUT WITH THE CABLES CONNECTED FOR MAINTENANCE.
2) USE M10 BOLTS OR φ9 COACH SCREWS FOR FIXING THE UNIT.
3) # : RECOMMENDED SERVICING CLEARANCE.



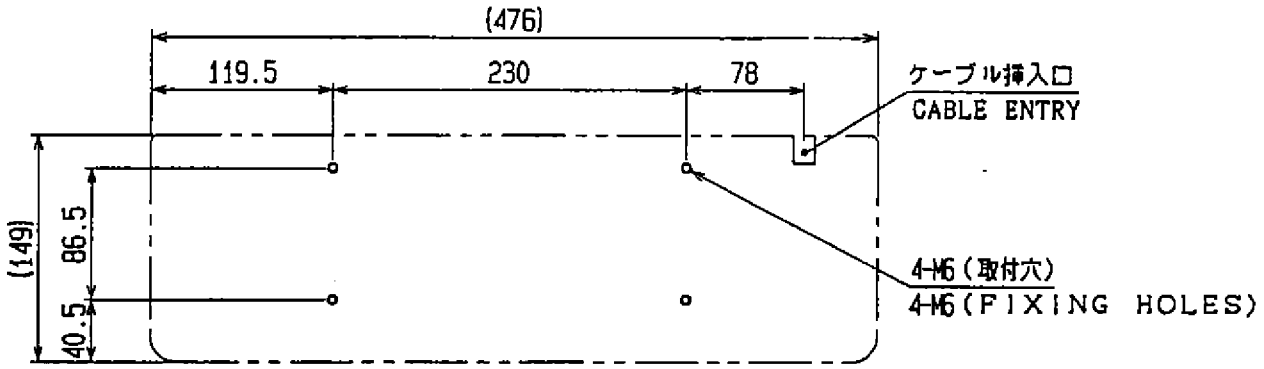




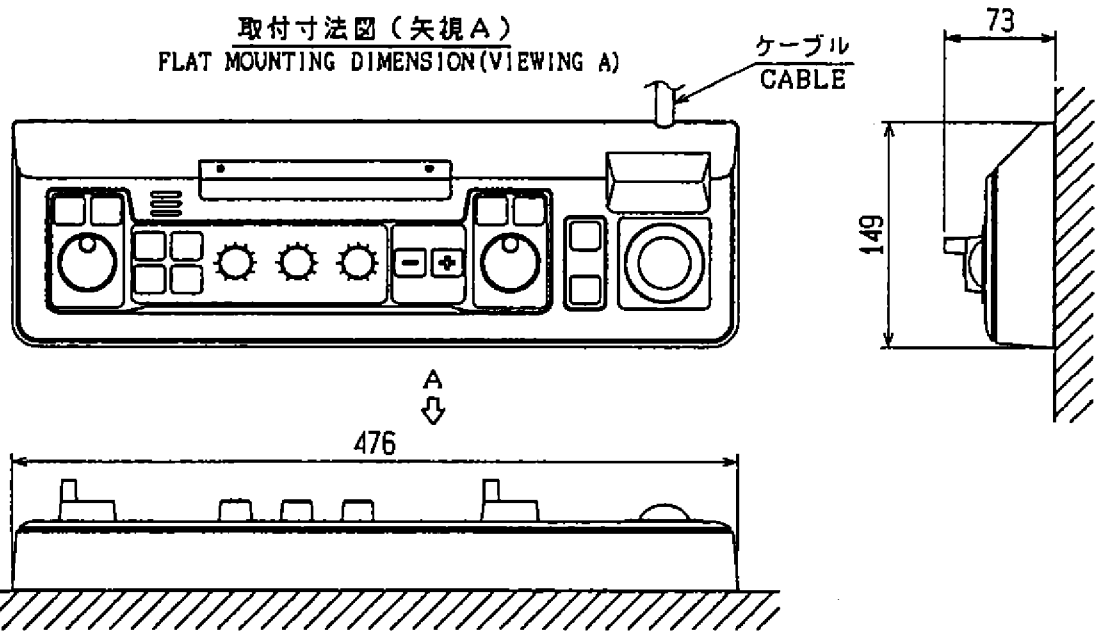
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	備考 REMARKS

承認 APPROVED	JUL-20-'93 H.Nagoshi	三角法 THIRD ANGLE PROJECTION	名称 TITLE: RDP-106 指示部（卓上型パネル分離型） DISPLAY UNIT (TABLETOP, PANEL SEPARATED)
検図 CHECKED	JUL-20-'93 M.Ishihara	尺度 SCALE	
製図 DRAWN	JUL-16-'93 Y. TANABE	重量 WEIGHT 54 kg	図番 DWG. NO. C3382-G06-D

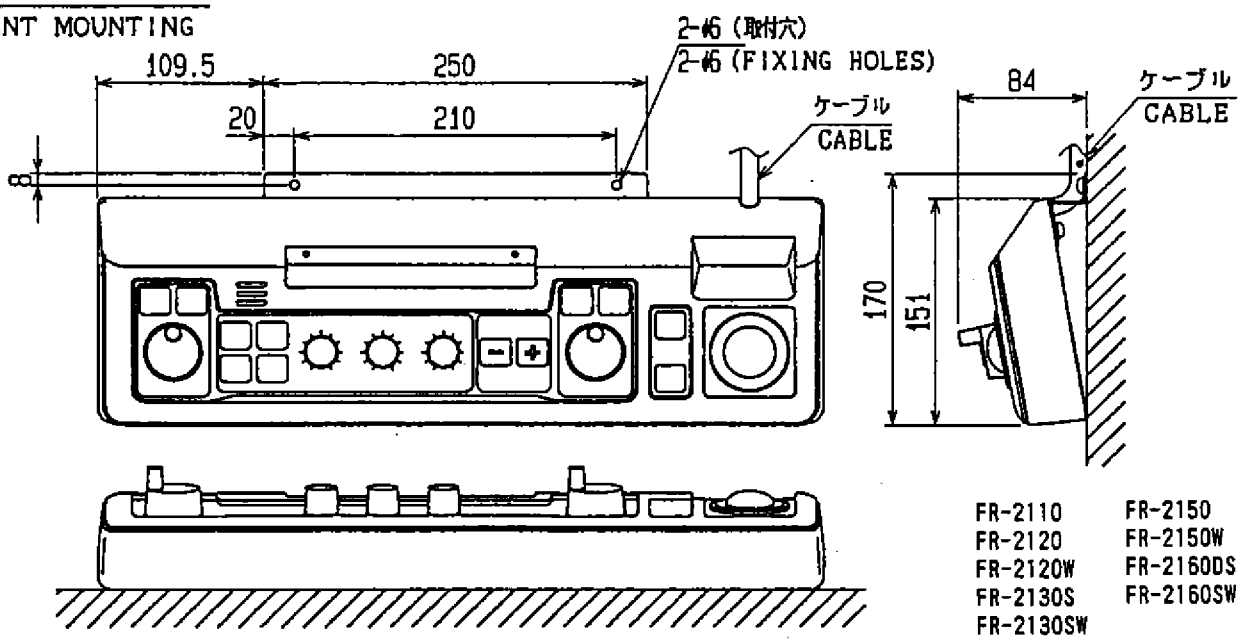
FR-2110
FR-2120
FR-2120W
FR-2130S
FR-2130SW
FR-2150
FR-2150W
FR-2160DS
FR-2160SW



取付寸法図（矢視A）
FLAT MOUNTING DIMENSION(VIEWING A)



＊ＫＢ固定金具使用時
SLANT MOUNTING



FR-2110
FR-2120
FR-2120W
FR-2130S
FR-2130SW
FR-2150
FR-2150W
FR-2160DS
FR-2160SW

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	JUL・20・'93 H.Magoshi	三角法 THIRD ANGLE PROJECTION		名称 TITLE	操作部（指示部操作パネル） DISPLAY CONTROL PANEL
検図 CHECKED	JUL・20・'93 M.Ishihara	尺度 SCALE	1/5	RDP-106	
製図 DRAWN	JUL・16・'93 Y.TANABE	重量 WEIGHT	2.5 kg	図番 DWG.NO.	C3382-G05-C

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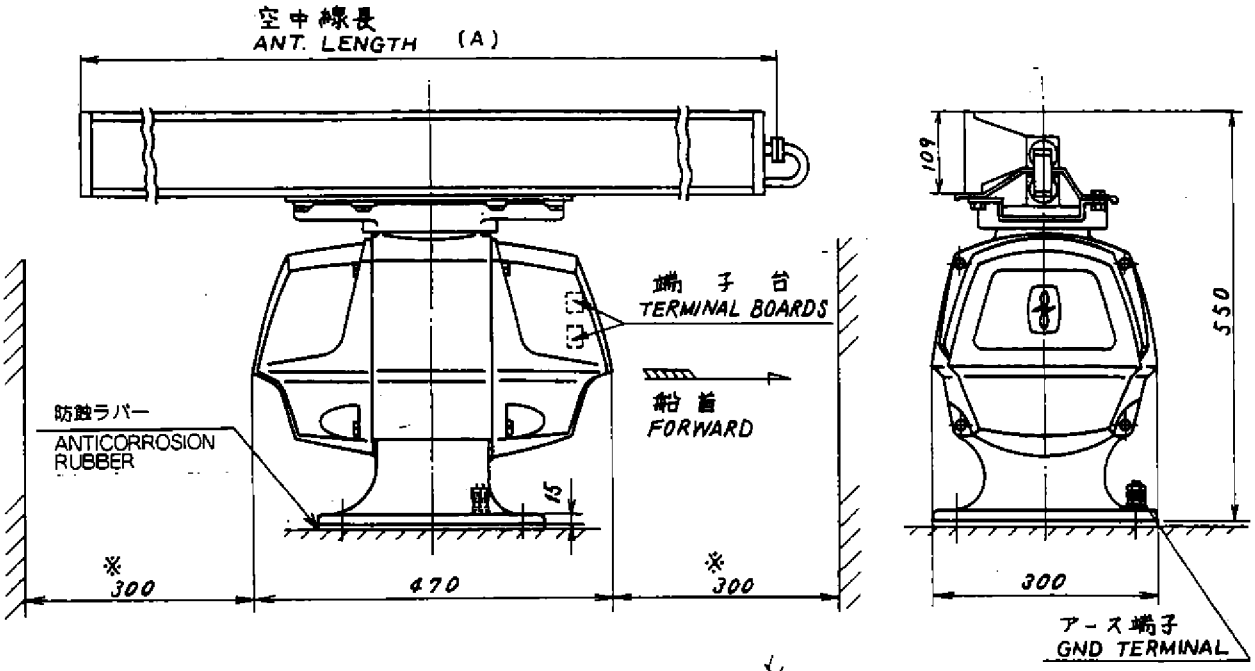
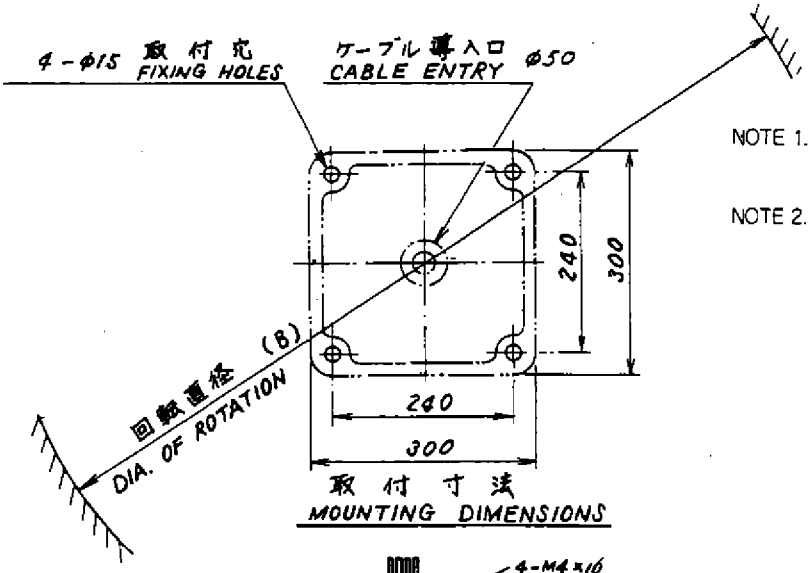




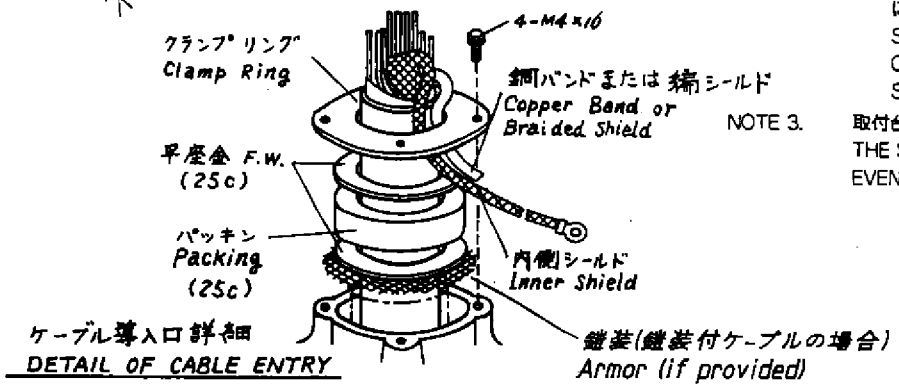
NOTE 1. ※：推奨サービス空間
RECOMMENDED SERVICING CLEARANCE

NOTE 2.

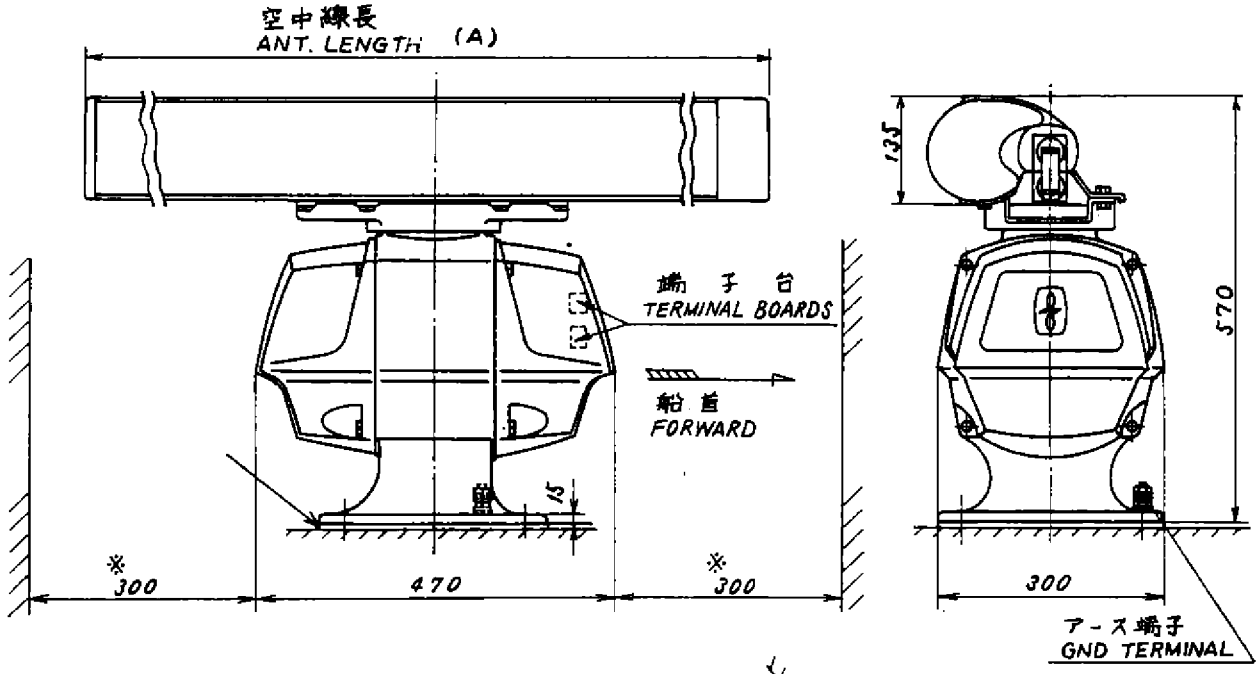
種類※※ ANT. TYPE	90cm型 TYPE	123cm型 TYPE	200cm型 TYPE
空中線長 ANT. LENGTH (A)	910mm	1250mm	2000mm
回転直径 DIA. OF ROTATION (B)	1100mm	1400mm	2200mm
質量 MASS	32kg	33kg	37.5kg

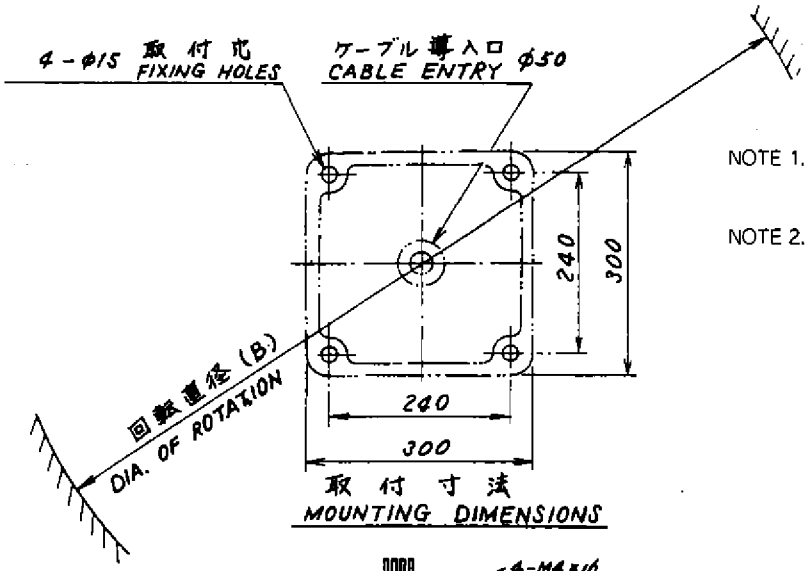
※※選択可能な空中線部種類はレーダー型式により異なる。各仕様を参照のこと。
SELECTABLE ANTENNA TYPE DEPENDS ON RADAR MODEL. SEE INDIVIDUAL SPECIFICATIONS.

NOTE 3. 取付台の平面度は±1mm以内のこと。
THE SURFACE OF PLATFORM SHOULD BE EVEN WITHIN ±1mm.



REMARKS XN1／2／3			TYPE RSB0063/C2P7N2N/C2P8N2N
DRAWN K.M / APPROVED	FR1510M2 FR2110		名称 空中線部 NAME RADAR SCANNER UNIT
SCALE 1／10 / MASS kg	APPLICABLE TO: (MODEL)	BLOCK NO.	DWG NO. C3237-001- U





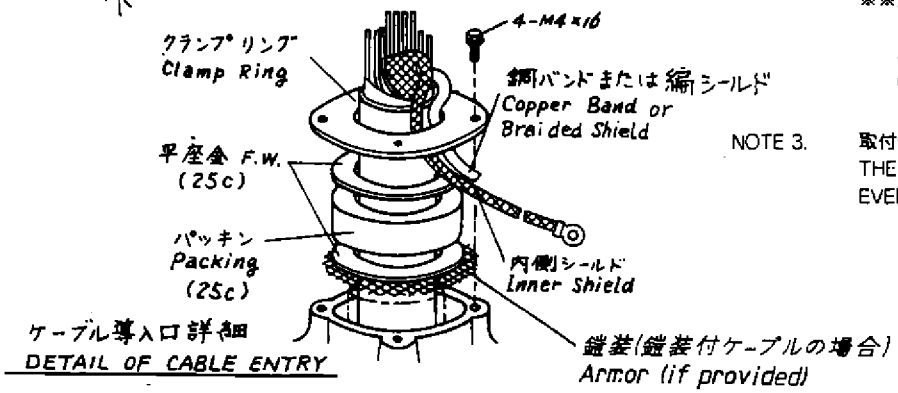
NOTE 1. ※：推奨サービス空間
RECOMMENDED SERVICING CLEARANCE

NOTE 2.

種類※※ ANT. TYPE	200cm型 TYPE (XN-3A)	240cm型 TYPE (XN-4A)
空中線長 ANT. LENGTH (A)	2070mm	2570mm
回転直径 DIA. OF ROTATION (B)	2200mm	2700mm
質量 MASS	36.5 kg	38.5kg

※※選択可能な空中線部種類はレーダー型式により異なる。各仕様を参照のこと。
SELECTABLE ANTENNA TYPE DEPENDS ON RADAR MODEL. SEE INDIVIDUAL SPECIFICATIONS.

NOTE 3. 取付台の平面度は±1mm以内のこと。
THE SURFACE OF PLATFORM SHOULD BE EVEN WITHIN ±1mm.



REMARKS XN3A/4A			TYPE RSB0063/C2P7N2N/C2P8N2N
			名称 空中線部
DRAWN K.M / APPROVED			NAME RADAR SCANNER UNIT
SCALE 1/10 / MASS kg	APPLICABLE TO; (MODEL)	BLOCK NO.	DWG NO. C3249-011- P

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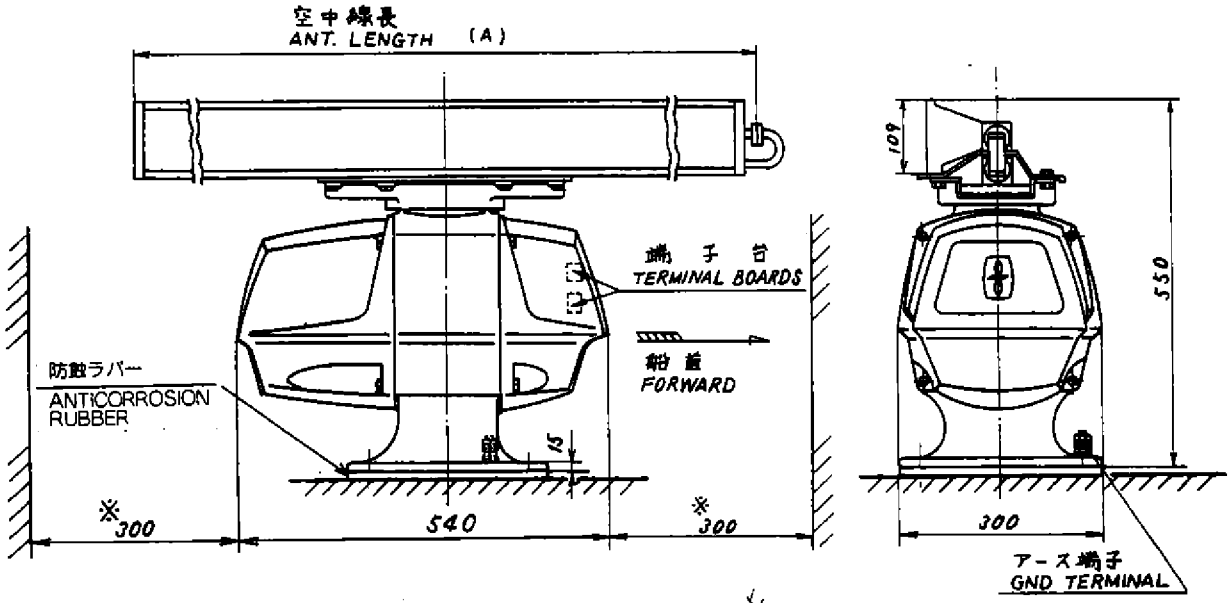
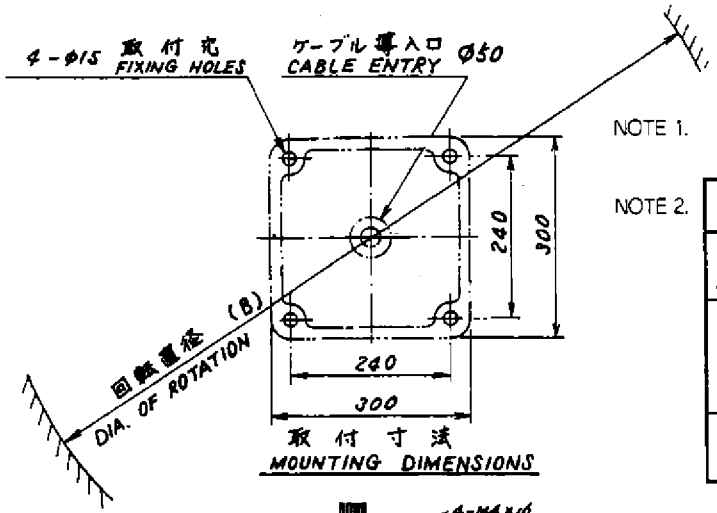




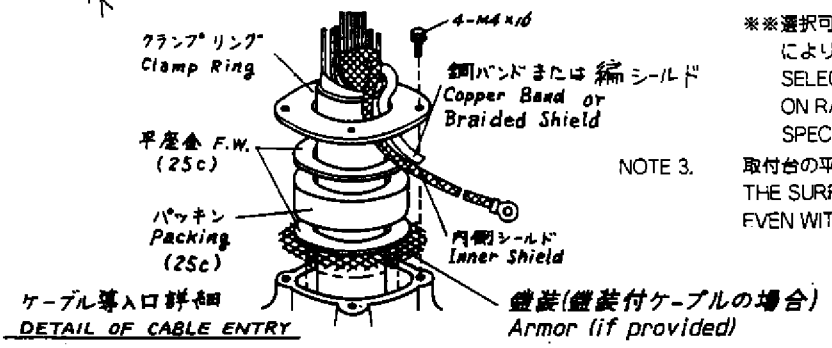
NOTE 1. ※：推奨サービス空間
RECOMMENDED SERVICING CLEARANCE

NOTE 2.

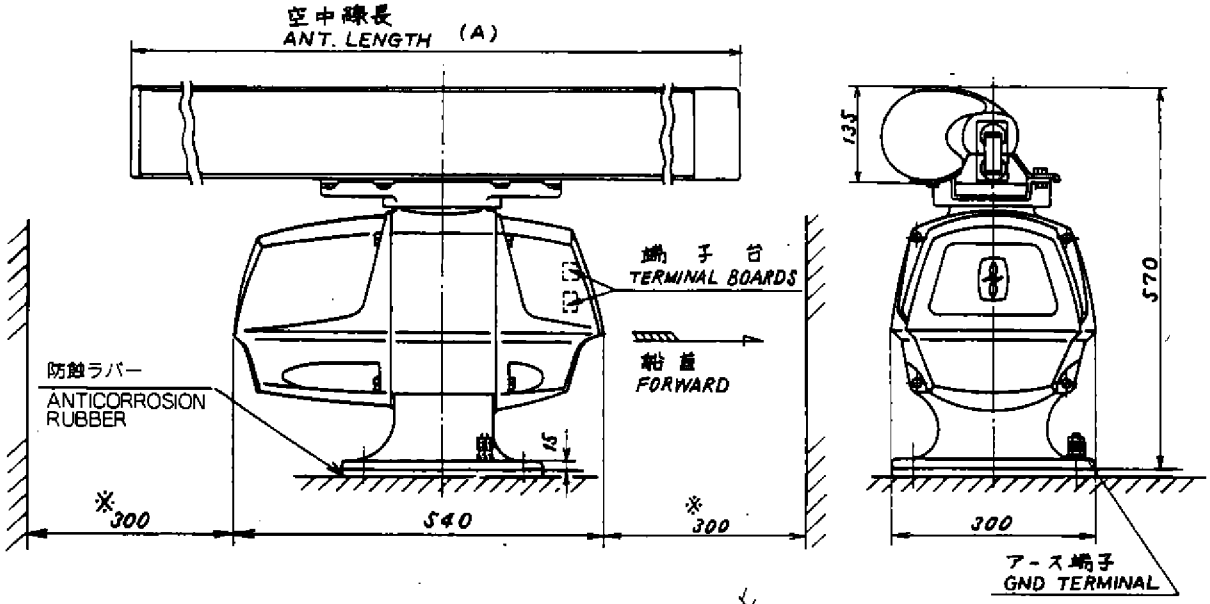
種類※※ ANT. TYPE	123cm 型 TYPE	200cm 型 TYPE
空中線長 ANT. LENGTH (A)	1250mm	2000mm
回転直径 DIA. OF ROTATION (B)	1400mm	2200mm
質量 MASS	35kg	40kg

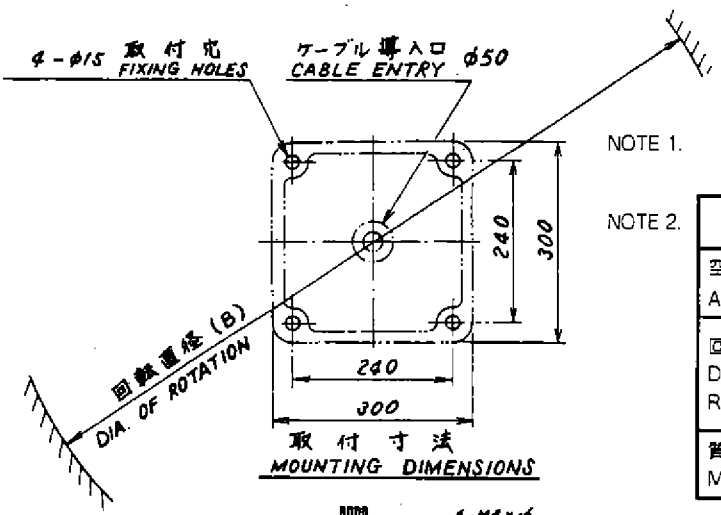
※※選択可能な空中線部種類はレーダー型式により異なる。各仕様を参照のこと。
SELECTABLE ANTENNA TYPE DEPENDS ON RADAR MODEL. SEE INDIVIDUAL SPECIFICATIONS.

NOTE 3. 取付台の平面度は±1mm以内のこと。
THE SURFACE OF PLATFORM SHOULD BE EVEN WITHIN ±1mm.



REMARKS XN2/3			TYPE	RSB0014/RSB0064
DRAWN K.M	APPROVED NOV '94 IKEDA	FR1525M2 FR2120	名称	空中線部
SCALE 1/10	MASS kg	APPLICABLE TO: (MODEL)	BLOCK NO.	NAME RADAR SCANNER UNIT
				DWG NO. C3290-004- J





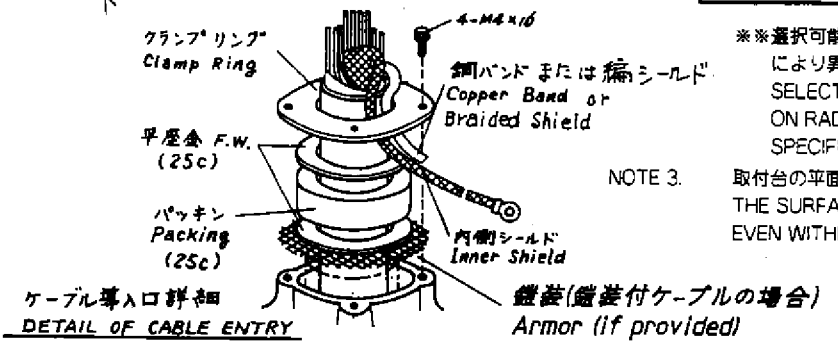
NOTE 1. ※: 推奨サービス空間
RECOMMENDED SERVICING CLEARANCE

NOTE 2.

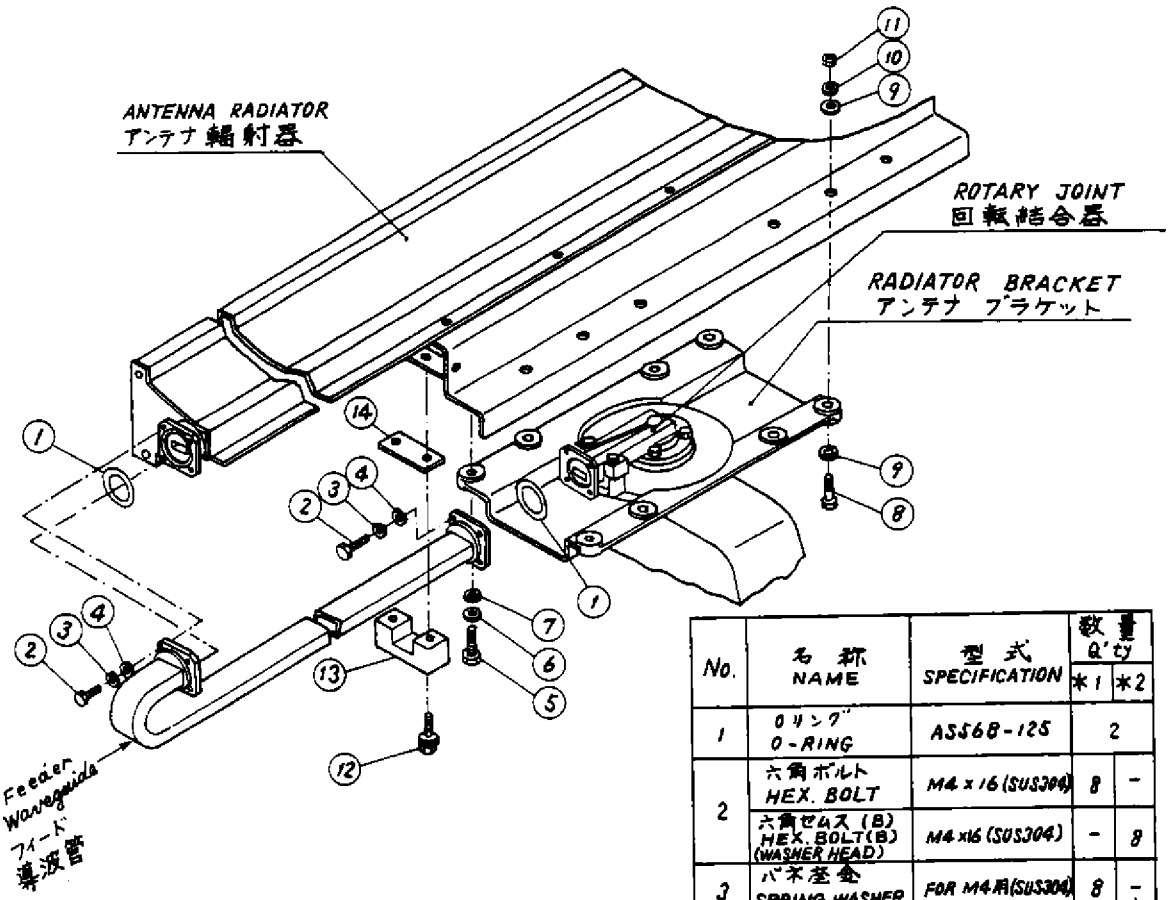
種類※※ ANT. TYPE	200cm 型 TYPE (XN-3A)	240cm 型 TYPE (XN-4A)
空中線長 ANT. LENGTH (A)	2070mm	2570mm
回転直径 DIA. OF ROTATION (B)	2200mm	2700mm
質量 MASS	39kg	42kg

※※選択可能な空中線部種類はレーダー型式により異なる。各仕様を参照のこと。
SELECTABLE ANTENNA TYPE DEPENDS ON RADAR MODEL. SEE INDIVIDUAL SPECIFICATIONS.

NOTE 3. 取付台の平面度は±1mm以内のこと。
THE SURFACE OF PLATFORM SHOULD BE EVEN WITHIN ±1mm.



REMARKS XN3A/4A			TYPE RSB0014/RSB0064
DRAWN K.M / APPROVED KEDA Nov 7 '94		FR1525M2 FR2120	名称 空中線部
SCALE 1/10 / MASS kg	APPLICABLE TO: (MODEL)	BLOCK NO.	NAME RADAR SCANNER UNIT
			DWG NO. C3290-003- J



No.	名称 NAME	型式 SPECIFICATION	数量 Q'ty *1	数量 Q'ty *2
1	Oリング O-RING	AS568-125	2	
2	六角ボルト HEX. BOLT	M4×16 (SUS304)	8	-
	六角セムス(B) HEX. BOLT(B) (WASHER HEAD)	M4×16 (SUS304)	-	8
3	バネ座金 SPRING WASHER	FOR M4用(SUS304)	8	-
4	平座金 FLAT WASHER	FOR M4用(SUS304)	8	-
5	六角ボルト HEX. BOLT	M8×25(SUS304)	4	-
	六角セムス(A) HEX. BOLT(A) (WASHER HEAD)	M6×25	-	6
6	バネ座金 SPRING WASHER	FOR M8用(SUS304)	4	-
7	平座金 FLAT WASHER	FOR M8用(SUS304)	4	-
		RSG-1002-0	-	6
8	六角ボルト HEX. BOLT	M8×30(SUS304)	4	6
9	平座金 FLAT WASHER	FOR M8用(SUS304)	8	12
10	バネ座金 SPRING WASHER	FOR M8用(SUS304)	4	6
11	六角ナット HEX. NUT	M8(SUS304)	4	6
12	六角セムス(B) HEX. BOLT(B) (WASHER HEAD)	M4×25	-	2
13	導波管押え W/G CLAMP	RSB-2006-1	-	1
14	導波管パッキン W/G PACKING	RSB-2008-0	-	1

*1: 900/1230mm アンテナ用 (XN-1/2)
FOR 900/1230mm RADIATOR (XN-1/2)

*2: 2000mm アンテナ (XN-3) 用
FOR 2000mm RADIATOR (XN-3)

注意:
1. 電蝕防止のため、組立時にボルト、ナット、ワッシャ及びフランジ面のOリング溝外側の部分に支給のシリコンシール剤(無酸性)を塗布する。Oリング及びOリングの溝には塗布しないこと。
2. Oリングに傷をつけたり、ゴミを付着させないように注意のこと。
3. Oリング及びスキャナーカバーのパッキンにはグリースを使用すること。シリコンシール剤は使用不可。

NOTE:
1. APPLY SILICONE SEALANT (SUPPLIED, NON-ACID TYPE) ON BOLTS, NUTS, WASHER AND WAVEGUIDE FLANGE OUTSIDE O-RING GROOVE TO AVOID ELECTRICAL CORROSION. (DO NOT APPLY SEALANT TO O-RINGS AND O-RING GROOVES.)
2. DO NOT PINCH O-RING AND KEEP IT CLEAN.
3. FOR PACKINGS OF SCANNER COVERS AND O-RINGS, DO NOT USE SILICONE SEALANT, BUT RATHER USE GREASE.

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	MAY.25.'79	三角法 THIRD ANGLE PROJECTION	名称 TITLE 空中線部組立図 SCANNER UNIT ASSEMBLING
検図 CHECKED	MAY.25.'79	尺度 SCALE	空中線長 ANT. LENGTH: 900, 1230 & 2000mm (XN-1/2/3)
製図 DRAWN	25.5.'79	重量 WEIGHT kg	図番 DWG.NO. C3237-025-J

REV.: 2/83, 8/83, 7/88

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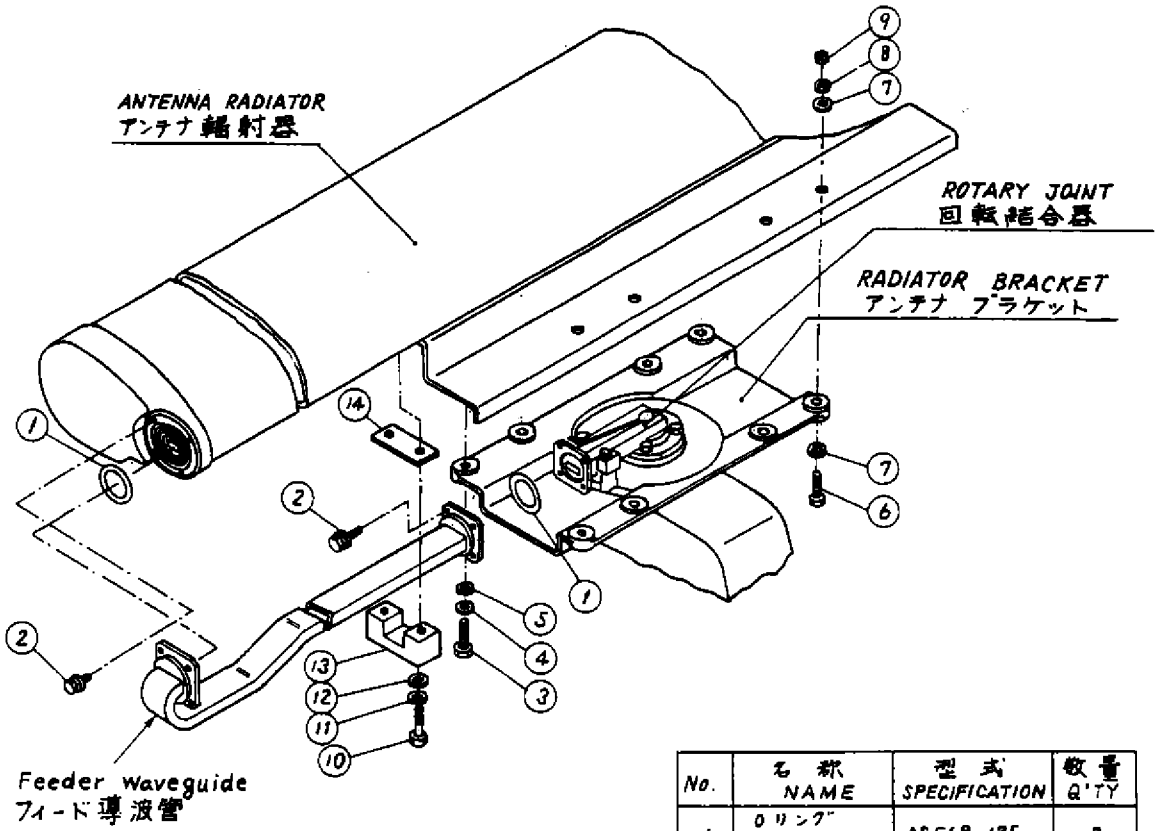


No.	名称 NAME	型式 SPECIFICATION	数量 Q'TY
1	Oリング O-RING	AS568-125	2
2	六角セムス(B) HEX. BOLT(B) (WASHER HEAD)	M4×16 (SUS304)	8
3	六角ボルト HEX. BOLT	M8×35(SUS304)	4
4	バネ座金 SPRING WASHER	FOR M8用(SUS304)	4
5	平座金 FLAT WASHER	FOR M8用(SUS304)	4
6	六角ボルト HEX. BOLT	M8×30 (SUS304)	4
7	平座金 FLAT WASHER	FOR M8用(SUS304)	8
8	バネ座金 SPRING WASHER	FOR M8用(SUS304)	4
9	六角ナット HEX. NUT	M8(SUS304)	4
10	六角ボルト HEX. BOLT	M4×30(SUS304)	2
11	バネ座金 SPRING WASHER	FOR M4用(SUS304)	2
12	平座金 FLAT WASHER	FOR M4用(SUS304)	2
13	導波管押え W/G CLAMP	RSB-2006-1	1
14	導波管間座 W/G PACKING	03-003-4003-0	1

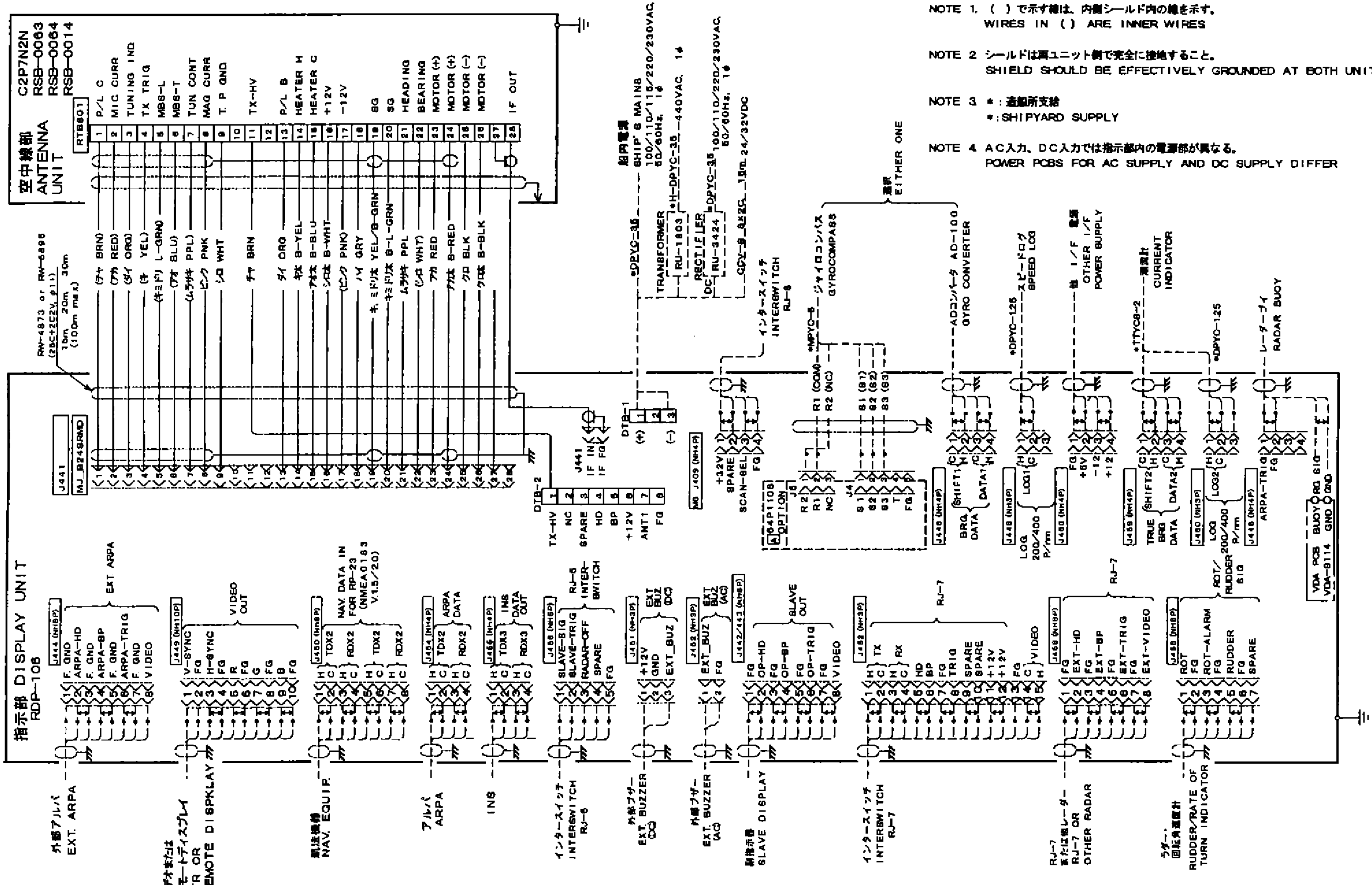
注意:
1. 電蝕防止のため、組立時にボルト、ナット、ワッシャ及びフランジ面のOリング溝外側の部分に支給のシリコンシール剤(無酸性)を塗布する。Oリング及びOリングの溝には塗布しないこと。
2. Oリングに傷をつけたり、ゴミを付着させないように注意のこと。
3. Oリング及びスキャナーカバーのパッキンにはグリースを使用すること。シリコンシール剤は使用不可。

NOTE:
1. APPLY SILICONE SEALANT (SUPPLIED, NON-ACID TYPE) ON BOLTS, NUTS, WASHER AND WAVEGUIDE FLANGE OUTSIDE O-RING GROOVE TO AVOID ELECTRICAL CORROSION. (DO NOT APPLY SEALANT TO O-RINGS AND O-RING GROOVES.)
2. DO NOT PINCH O-RING AND KEEP IT CLEAN.
3. FOR PACKINGS OF SCANNER COVERS AND O-RINGS, DO NOT USE SILICONE SEALANT, BUT RATHER USE GREASE.

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	MAY. 25. '79	三角法 THIRD ANGLE PROJECTION		名称 TITLE	空中線部組立図 SCANNER UNIT ASSEMBLING (XN3A/XN4A)
検図 CHECKED	MAY. 25. '79	尺度 SCALE	/		
製図 DRAWN	25. 5. 79	重量 WEIGHT	kg	図番 DWG.NO.	C3249-017-H

FURUNO



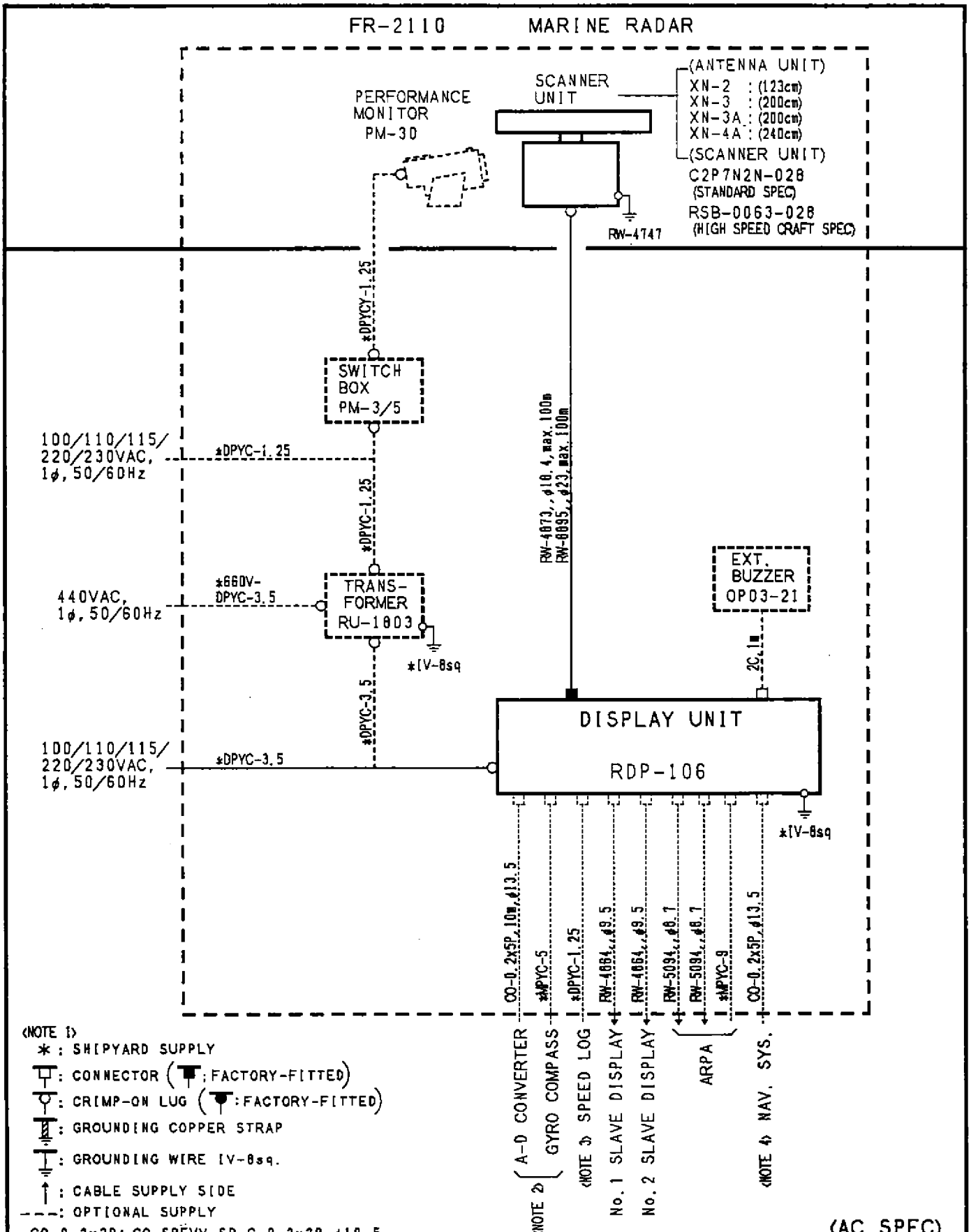
NOTE 1. （ ）で示す線は、内側シールド内の線を示す。
WIRES IN ( ) ARE INNER WIRES

NOTE 2 シールドは両ユニット側で完全に接地すること。
SHIELD SHOULD BE EFFECTIVELY GROUNDED AT BOTH UNIT ENDS

NOTE 3 ＊：造船所支給
＊：SHIPYARD SUPPLY

NOTE 4 AC入力、DC入力では指示部内の電源部が異なる。
POWER PCBS FOR AC SUPPLY AND DC SUPPLY DIFFER

DRAWN	July 11 '97 T. Yamasaki	TITLE	FR-2120/2110
CHECKED	K. Kusunoki	名 称	船舶用レーダー
APPROVED	K. Kusunoki		相互結線図
SCALE -	MASS -	NAME	MARINE RADAR
DWG.No.	C3382-C01- G		INTERCONNECTION DIAGRAM



(AC SPEC)

(NOTE 1)
- * : SHIPYARD SUPPLY
- : CONNECTOR (: FACTORY-FITTED)
- : CRIMP-ON LUG (: FACTORY-FITTED)
- : GROUNDING COPPER STRAP
- : GROUNDING WIRE IV-8sq.
- : CABLE SUPPLY SIDE
- ---: OPTIONAL SUPPLY

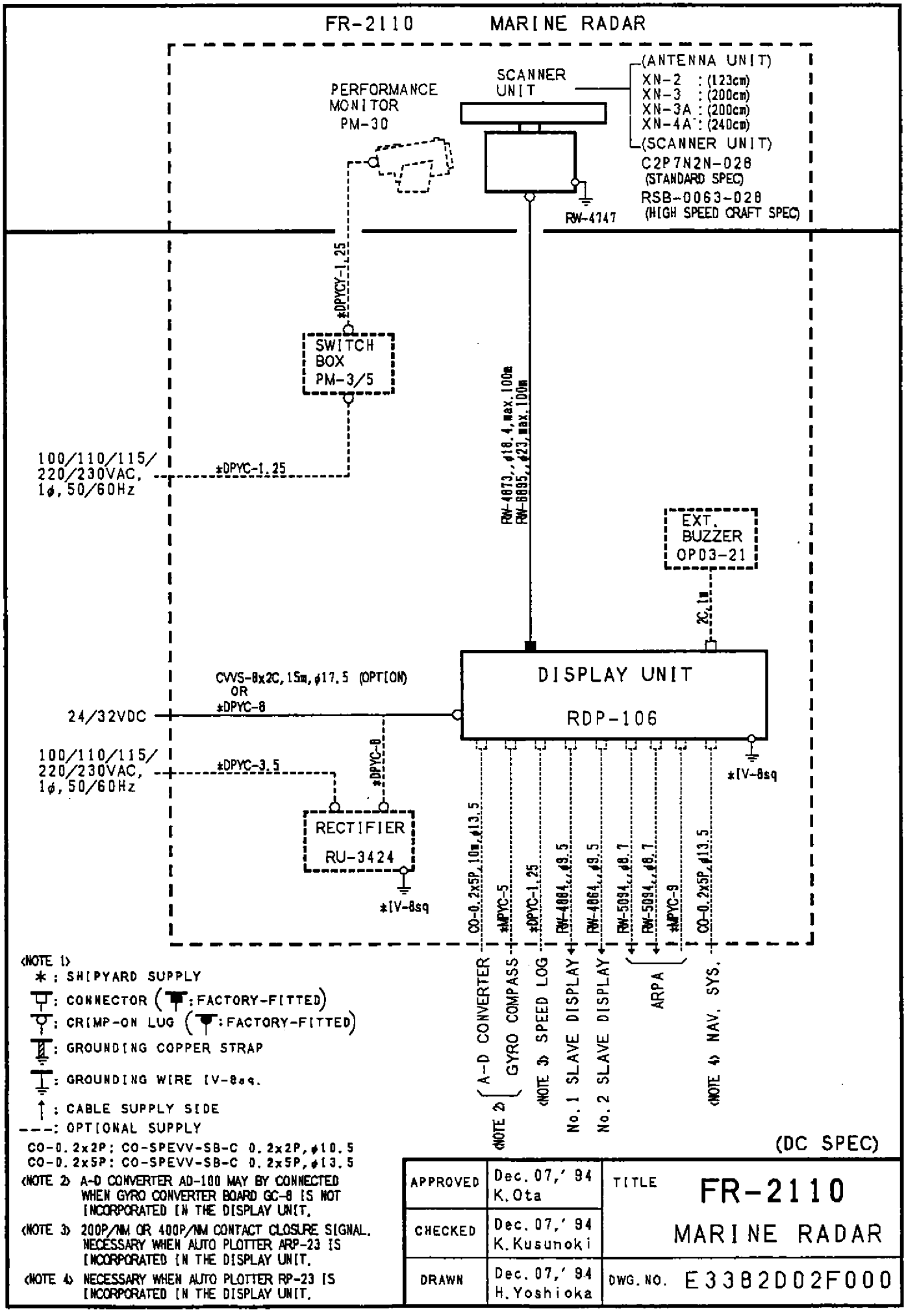
CO-0.2x2P: CO-SPEVV-SB-C 0.2x2P, φ10.5
CO-0.2x5P: CO-SPEVV-SB-C 0.2x5P, φ13.5

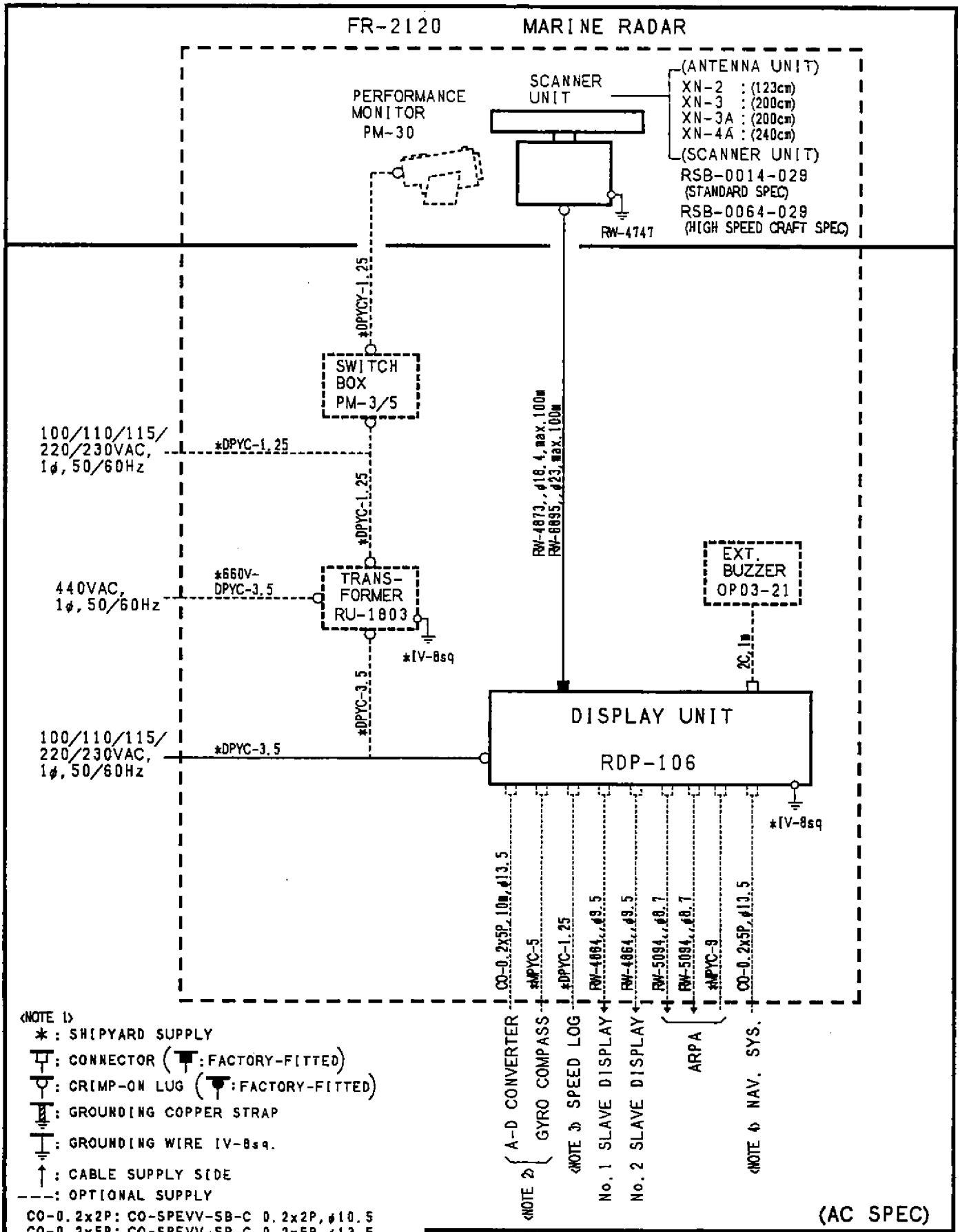
(NOTE 2) A-D CONVERTER AD-100 MAY BY CONNECTED WHEN GYRO CONVERTER BOARD GC-8 IS NOT INCORPORATED IN THE DISPLAY UNIT.

(NOTE 3) 200P/NM OR 400P/NM CONTACT CLOSURE SIGNAL. NECESSARY WHEN AUTO PLOTTER ARP-23 IS INCORPORATED IN THE DISPLAY UNIT.

(NOTE 4) NECESSARY WHEN AUTO PLOTTER RP-23 IS INCORPORATED IN THE DISPLAY UNIT.

APPROVED	Dec. 07,' 94 K. Ota	TITLE	FR-2110 MARINE RADAR
CHECKED	Dec. 07,' 94 K. Kusunoki		
DRAWN	Dec. 07,' 94 H. Yoshioka	DWG. NO.	E3382D01F000


FR-2110 MARINE RADAR
(ANTENNA UNIT)
XN-2 : (123cm)
XN-3 : (200cm)
XN-3A : (200cm)
XN-4A : (240cm)
(SCANNER UNIT)
C2P7N2N-028
(STANDARD SPEC)
RSB-0063-028
(HIGH SPEED CRAFT SPEC)
SCANNER UNIT
PERFORMANCE MONITOR PM-30
RW-4747
±DPYCY-1.25
SWITCH BOX PM-3/5
100/110/115/ 220/230VAC, 1φ, 50/60Hz
±DPYC-1.25
RW-4873, φ18.4, max.100m
RW-6885, φ23, max.100m
EXT. BUZZER OP03-21
2C, 1m
DISPLAY UNIT
RDP-106
CVVS-8x2C, 15m, φ17.5 (OPTION)
OR
±DPYC-8
24/32VDC
100/110/115/ 220/230VAC, 1φ, 50/60Hz
±DPYC-3.5
±DPYC-8
RECTIFIER RU-3424
±IV-8sq
±IV-8sq
CO-0.2x5P, 10m, φ13.5
±MPYC-5
±DPYC-1.25
RW-4864, φ9.5
RW-4864, φ9.5
RW-5094, φ8.7
RW-5094, φ8.7
±MPYC-9
CO-0.2x5P φ13.5
(NOTE 2) A-D CONVERTER
GYRO COMPASS
(NOTE 3) SPEED LOG
No.1 SLAVE DISPLAY
No.2 SLAVE DISPLAY
ARPA
(NOTE 4) NAV. SYS.
(NOTE 1)
*: SHIPYARD SUPPLY
: CONNECTOR (: FACTORY-FITTED)
: CRIMP-ON LUG (: FACTORY-FITTED)
: GROUNDING COPPER STRAP
: GROUNDING WIRE IV-8sq.
: CABLE SUPPLY SIDE
---: OPTIONAL SUPPLY
CO-0.2x2P: CO-SPEVV-SB-C 0.2x2P, φ10.5
CO-0.2x5P: CO-SPEVV-SB-C 0.2x5P, φ13.5
(NOTE 2) A-D CONVERTER AD-100 MAY BY CONNECTED WHEN GYRO CONVERTER BOARD GC-8 IS NOT INCORPORATED IN THE DISPLAY UNIT.
(NOTE 3) 200P/NM OR 400P/NM CONTACT CLOSURE SIGNAL. NECESSARY WHEN AUTO PLOTTER ARP-23 IS INCORPORATED IN THE DISPLAY UNIT.
(NOTE 4) NECESSARY WHEN AUTO PLOTTER RP-23 IS INCORPORATED IN THE DISPLAY UNIT.
(DC SPEC)
APPROVED Dec. 07,' 94 K.Ota
CHECKED Dec. 07,' 94 K.Kusunoki
DRAWN Dec. 07,' 94 H.Yoshioka
TITLE FR-2110 MARINE RADAR
DWG.NO. E3382D02F000



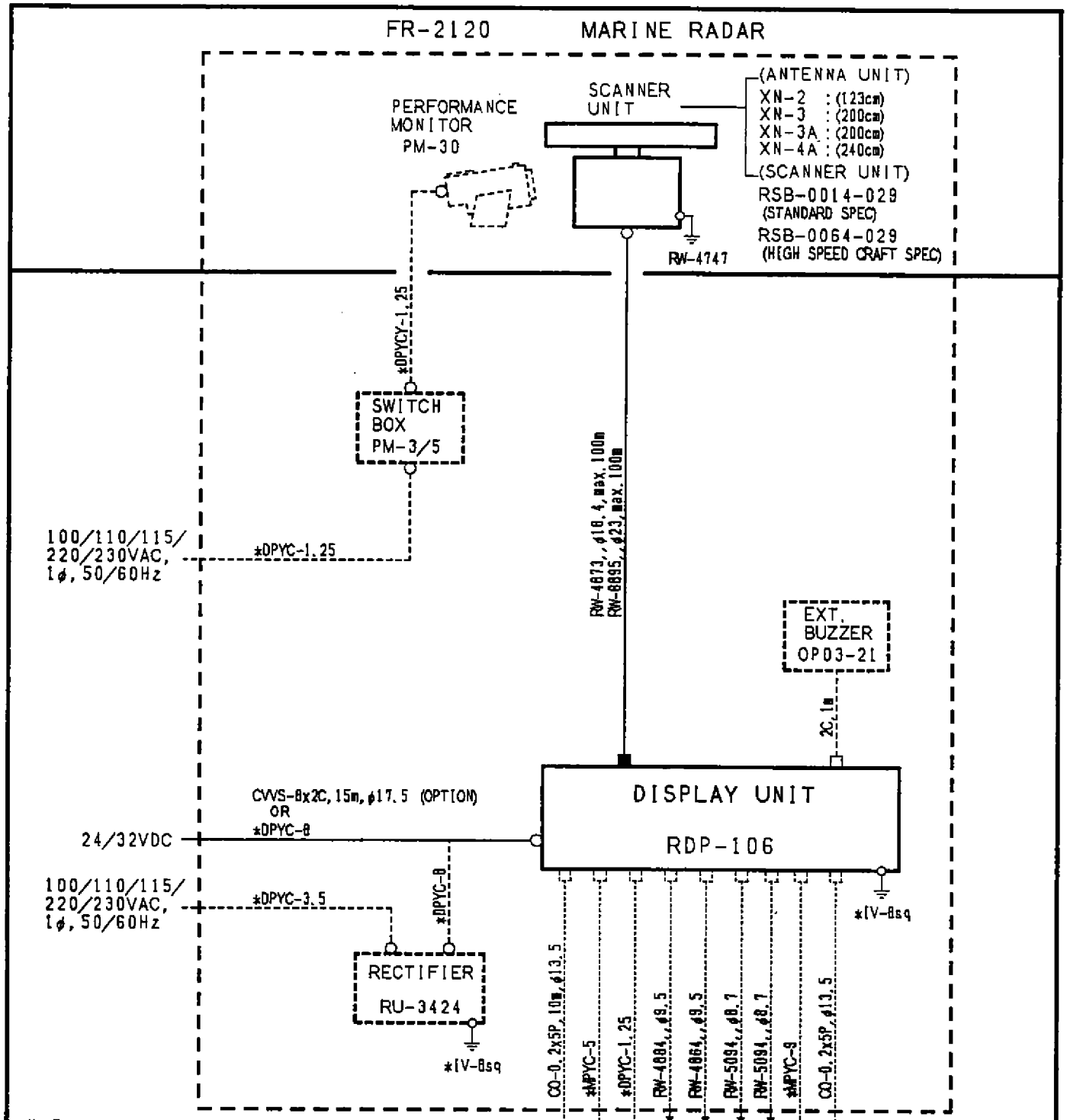
<NOTE 1>
* : SHIPYARD SUPPLY
: CONNECTOR (: FACTORY-FITTED)
: CRIMP-ON LUG (: FACTORY-FITTED)
: GROUNDING COPPER STRAP
: GROUNDING WIRE IV-8sq.
: CABLE SUPPLY SIDE
---: OPTIONAL SUPPLY
CO-0.2x2P: CO-SPEVV-SB-C 0.2x2P, φ10.5
CO-0.2x5P: CO-SPEVV-SB-C 0.2x5P, φ13.5

<NOTE 2> A-D CONVERTER AD-100 MAY BY CONNECTED WHEN GYRO CONVERTER BOARD GC-8 IS NOT INCORPORATED IN THE DISPLAY UNIT.

<NOTE 3> 200P/NM OR 400P/NM CONTACT CLOSURE SIGNAL. NECESSARY WHEN AUTO PLOTTER ARP-23 IS INCORPORATED IN THE DISPLAY UNIT.

<NOTE 4> NECESSARY WHEN AUTO PLOTTER RP-23 IS INCORPORATED IN THE DISPLAY UNIT.

APPROVED	Dec. 07,' 94 K. Ota	TITLE	FR-2120 MARINE RADAR
CHECKED	Dec. 07,' 94 K. Kusunoki		
DRAWN	Dec. 07,' 94 H. Yoshioka	DWG. NO.	E3383D01F000



(DC SPEC)

(NOTE 1)
* : SHIPYARD SUPPLY
: CONNECTOR (: FACTORY-FITTED)
: CRIMP-ON LUG (: FACTORY-FITTED)
: GROUNDING COPPER STRAP
: GROUNDING WIRE IV-8sq.
: CABLE SUPPLY SIDE
---: OPTIONAL SUPPLY

CO-0.2x2P: CO-SPEVV-SB-C 0.2x2P, φ10.5
CO-0.2x5P: CO-SPEVV-SB-C 0.2x5P, φ13.5

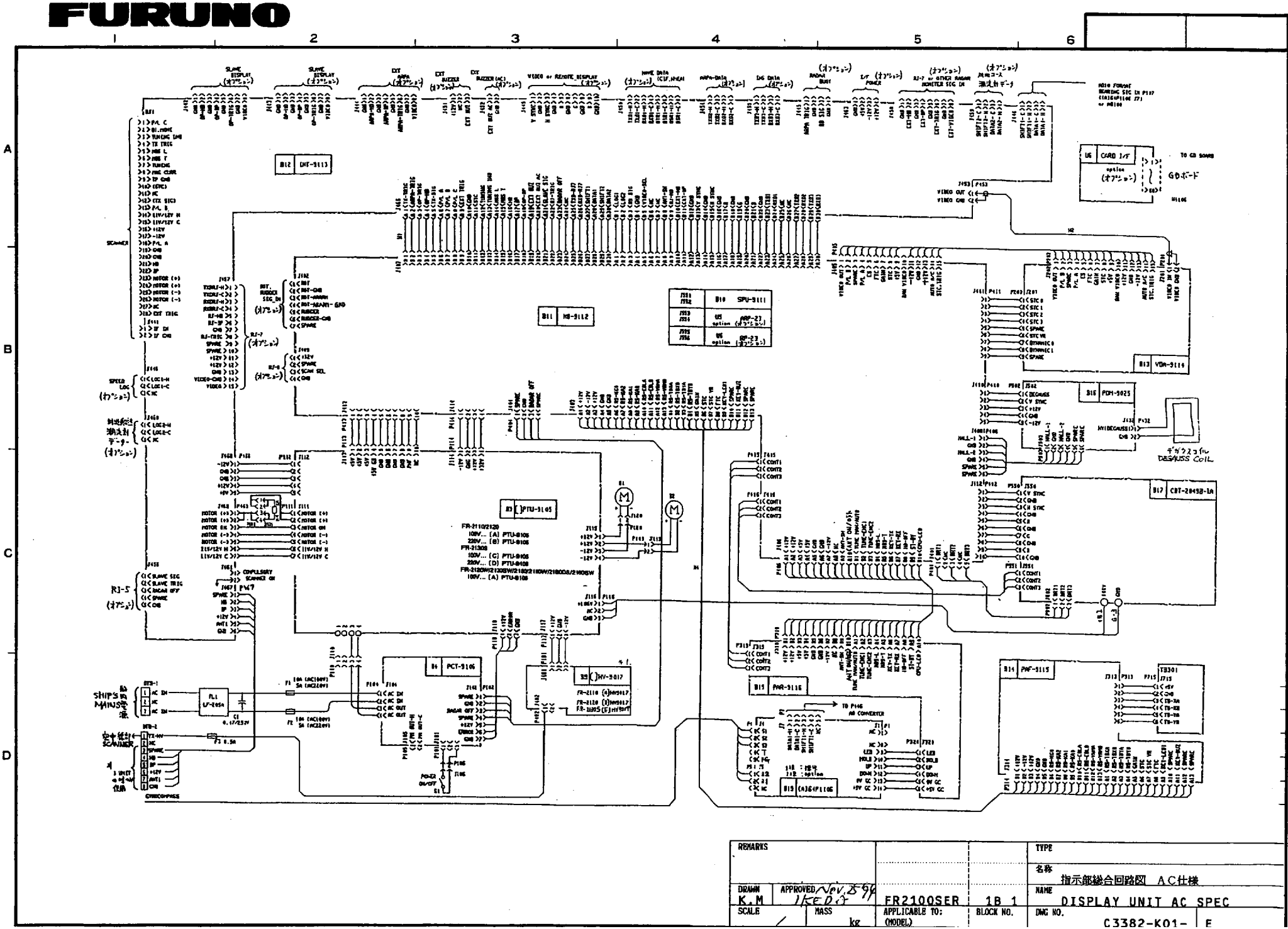
(NOTE 2) A-D CONVERTER AD-100 MAY BY CONNECTED WHEN GYRO CONVERTER BOARD GC-8 IS NOT INCORPORATED IN THE DISPLAY UNIT.

(NOTE 3) 200P/NM OR 400P/NM CONTACT CLOSURE SIGNAL. NECESSARY WHEN AUTO PLOTTER ARP-23 IS INCORPORATED IN THE DISPLAY UNIT.

(NOTE 4) NECESSARY WHEN AUTO PLOTTER RP-23 IS INCORPORATED IN THE DISPLAY UNIT.

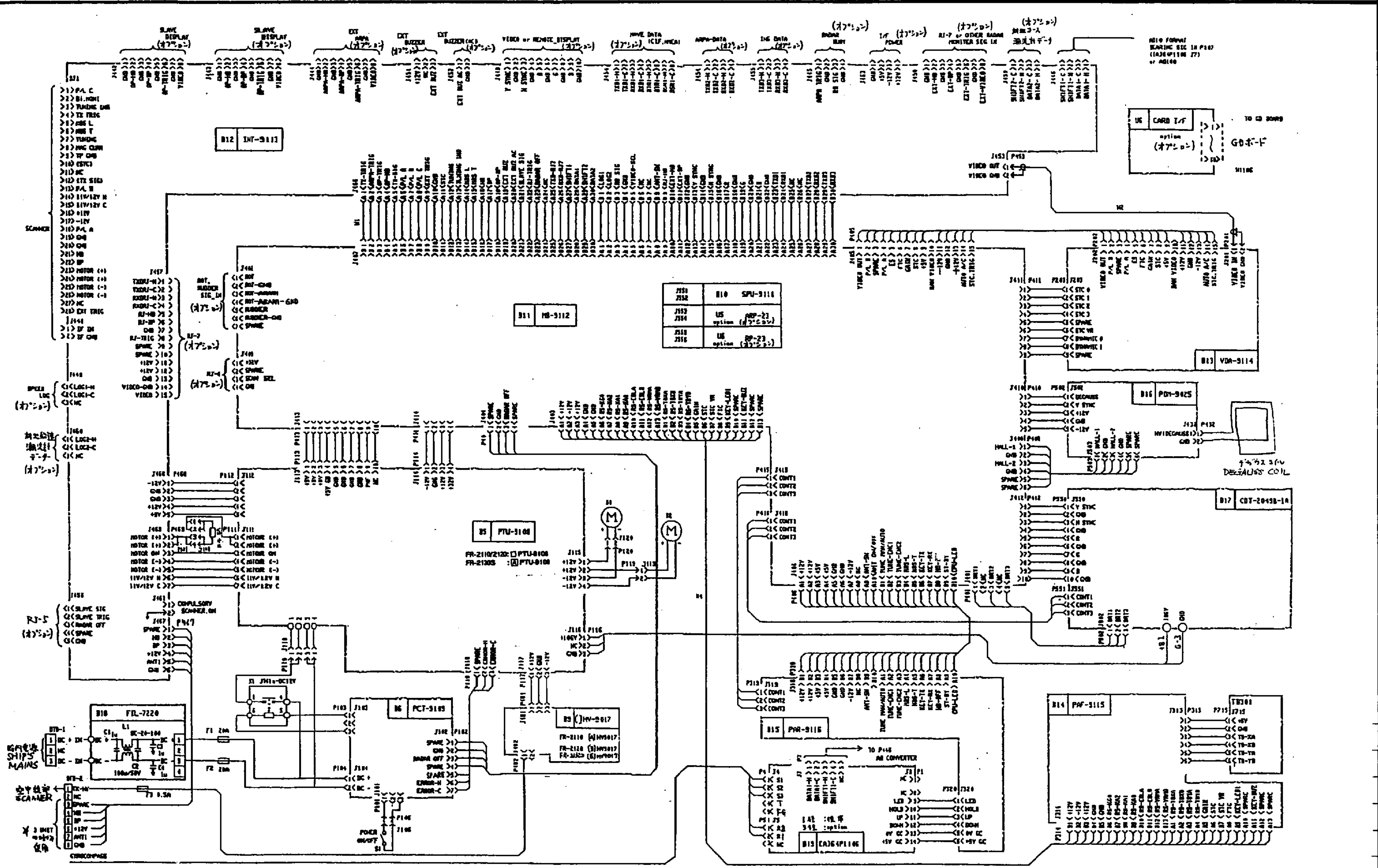
APPROVED	Dec. 07,' 94 K. Ota	TITLE	FR-2120 MARINE RADAR
CHECKED	Dec. 07,' 94 K. Kusunoki		
DRAWN	Dec. 07,' 94 H. Yoshioka	DWG. NO.	E3383D02F000

FURUNO



REMARKS				TYPE
				名称 指示部総合回路図 AC仕様
DRAWN K.M	APPROVED Nov.25'96 IKEDA	FR2100SER	1B 1	NAME DISPLAY UNIT AC SPEC
SCALE	MASS kg	APPLICABLE TO: (MODEL)	BLOCK NO.	DWG NO. C3382-K01- E

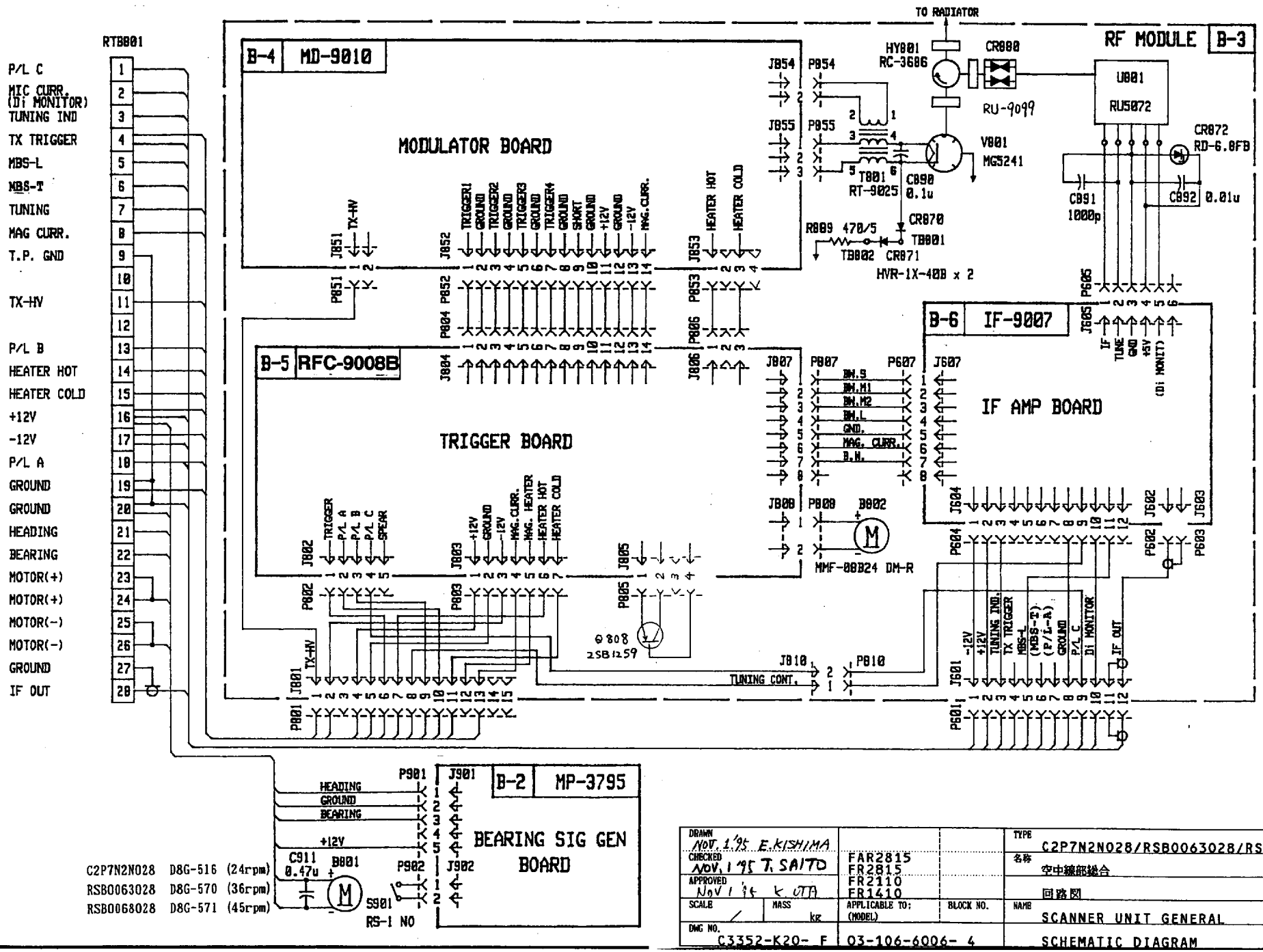
FURUNO



NOTE : ＊1…HV-9017 PCB IS NOT PROVIDED FOR FR-2120W/2150W/2150/2130SW/2160SW/2160DS.
FR-2120W/2150W/2150/2130SW/2160SW/2160DSのときHV-9017基板は不要。

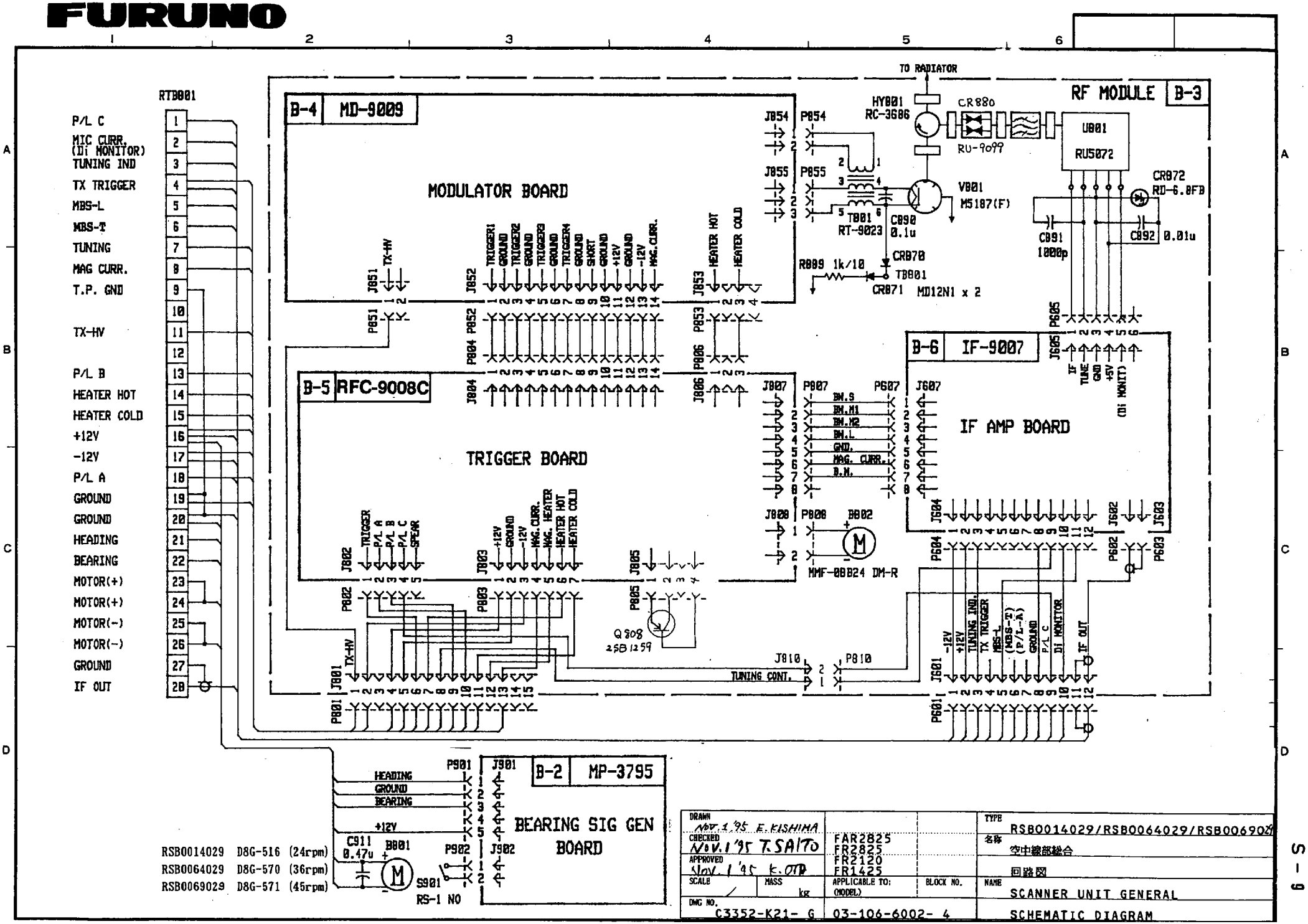
REMARKS			TYPE
DRAWN K.M	APPROVED NOV 25 '97 IKEDA	FR2100SER	1B 1	名称 指示部総合回路図 DC仕様
SCALE /	MASS kg	APPLICABLE TO: (MODEL)	BLOCK NO.	NAME DISPLAY UNIT DC SPEC
				DWG NO. C3382-K02- E

FURUNO



DRAWN Nov. 1'95 E.KISHIMA				TYPE C2P7N2N028/RSB0063028/RSB0069028
CHECKED Nov. 1'95 T. SAITO	FAR2815 FR2815 FR2110 FR1410			名称 空中線部総合
APPROVED Nov 1'95 K. UTA				回路図
SCALE /	MASS kg	APPLICABLE TO: (MODEL)	BLOCK NO.	NAME SCANNER UNIT GENERAL
DWG NO. C3352-K20- F		03-106-6006- 4		SCHEMATIC DIAGRAM

FURUNO



DRAWN Nov.1.'95 E.KISHIMA			TYPE RSB0014029/RSB0064029/RSB0069029
CHECKED Nov.1.'95 T.SAITO	FAR2825 FR2825 FR2120 FR1425		名称 空中線部総合
APPROVED Nov.1.'95 K.OTA			回路図
SCALE / MASS kg	APPLICABLE TO: (MODEL)	BLOCK NO.	NAME SCANNER UNIT GENERAL
DWG NO. C3352-K21- G	03-106-6002- 4		SCHEMATIC DIAGRAM

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